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An Analysis of Transcripts of Teachers and Arts and Sciences Graduates

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SREB

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CHAPTER I

INTRODUCTION AND PURPOSE

The education community and the public are currently reappraising how teachers are prepared. The National Commission for Excellence in Teacher Education* issued a report in March 1985 calling for changes in the preparation of teachers. The Commission acknowledges as valid the criticisms leveled at teacher education programs, and proposes improving both the general and professional education components. A "minority report" filed by nine of the seventeen Commission members states that the current four-year baccalaureate program is not long enough to encompass the needed improvements, and recommends a move to five years of preparation.

Another direction on teacher education is indicated by the "alternative certification" option, with New Jersey as the most notable example. Arts and sciences graduates who have majors in a discipline may be employed as teachers and obtain instruction about pedagogy through in-service programs. The impetus for the "alternative certification" stems partially from the public concern that teachers need more emphasis in college programs on what they will teach than on the methods of how to teach.

What is missing in most of the pronouncements and actions on teacher education is definitive information about what teachers are now taking in college. This study, which was partially funded by a grant from the National Endowment for the Humanities, analyzes the curriculum to which prospective teachers were exposed during their baccalaureate program in comparison with arts and sciences graduates. Over 6,000 transcripts of 1982-83 graduates from 17 universities in the South were studied. An implicit assumption is that improvement of preparation programs would attract better students. Proposals to reform teacher education programs are unlikely to be effective if they fail to address the reality of current teacher preparation programs.

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* Funded by a grant from the U. S. Department of Education to the American Association of Colleges of Teacher Education.

What kinds of courses are teachers taking in their general education component in college? How strong (or weak) is the preparation in the content they will be teaching? How much time do teachers spend in covering the pedagogy aspects? Does this time include practical applications of the theories on how to teach?

It is for the purpose of providing data on such questions that this transcript study was undertaken. A previous transcript study that also analyzed individual courses teachers took was done for 1960 and 1961 graduates by James D. Koerner.* Since that time, the curriculum of colleges and universities has undergone the pressures of the "relevance movement" of the 1960s. More recently, in some institutions, there has been renewed interest in a common core curriculum for all students. What changes have occurred in teacher education over the last two decades?

The 17 universities participating in the SREB transcript study include the major producers of teachers in each of the 14 Southern states and, thus, have a substantial impact on the supply of beginning teachers in their states. Their practices also affect those of smaller teacher education programs in a state. Therefore, this in-depth analysis of what is actually occurring in the curriculum of selected major programs is likely to be representative of a large proportion of teacher education graduates.

Chapter II details the methods followed in this study, and Chapter III provides background information about the graduates included in the project. Chapter IV details the findings on the general education courses of the graduates, while Chapter V describes their academic majors. The education courses are covered in Chapter VI, followed by comments in Chapter VII on qualitative aspects of the curriculum. Finally, Chapter VIII offers interpretation and conclusions, as well as directions for change, as indicated by the findings of the actual courses teachers take.

* James D. Koerner. The Miseducation of American Teachers. Boston: Houghton Mifflin Company, 1963.

CHAPTER II

METHODOLOGY

Population

Universities

The choice of the institutions selected to participate in this project was based on identifying the largest producers of teacher education graduates in each of the 14 SREB states in 1978-79. In some states, that was the "flagship" university; in other instances, it was another large state university. An initial inquiry regarding participation in the transcript study was sent to the presidents of 20 institutions--14 as the major producers of new teachers in each of the SREB-member states, plus 6 other institutions that either produced large numbers of teachers in their respective states or had expressed an interest in participating in this study.

Of the 20 institutions contacted, 17 finally participated in the study (see Appendix A). The major producer of teacher education graduates in each of the 14 SREB states is included in this total, plus three additional institutions that expressed an interest in participating. An effort was made to have all SREB states represented in the study, but no effort was made to make the selection of institutions representative in other respects.

Data Collection

Transcript Selection

For each of the institutions selected, transcripts were obtained for all 1982-83 baccalaureate graduates who were eligible for state teacher certification in the following areas: Special Education; Junior High or Middle School; English Education; Foreign Language Education; Reading Education; Fine Arts Education; Mathematics/Computer Science Education; Science Education; Social Studies Education; Secondary Education (general). One-half of all 1982-83 baccalaureate graduates eligible for state teacher certification in the areas of Elementary and/or Early Childhood Education and Physical and/or Health Education were randomly selected for inclusion in the study. The number of those students eligible

for certification in Elementary and/or Early Childhood Education and Physical and/or Health Education was reduced by half in order to obtain a manageable study size.

A stratified random sample for an equal number of transcripts of the 1982-83 arts and sciences graduates not certified to teach was also obtained from each institution. This sample was stratified to be representative of the distribution of degrees in the major divisions of the arts and sciences in each of the participating institutions. For the purposes of this study, the arts and sciences included the following classifications under the HEGIS (Higher Education General Information Survey) taxonomy of academic programs: Area Studies; Biological Sciences; Fine and Applied Arts; Foreign Languages; Letters; Mathematics; Physical Sciences; Psychology; and Social Sciences. Before the required stratified sample was selected at each institution, those arts and sciences graduates reported by the College of Education to have completed sufficient education courses to be certified to teach were eliminated from the population.

Classification by Major

Each transcript was classified by major and area of certification for those prepared to teach (henceforth referred to as "teachers") and by academic major for the sample of graduates not prepared to teach (henceforth referred to as "arts and sciences"). For a listing of the academic majors used to classify the arts and sciences graduates, see Table 1. For a listing of the majors in education and certification areas used to classify teaching majors, see Table 2.

Each of the students whose transcript was selected for inclusion in the study was classified into one of three categories:

Class 1--arts and sciences majors not certified to teach;
Class 2--arts and sciences majors certified to teach;
Class 3--education majors certified to teach.

To simplify the analysis of the data and obtain reasonable cell sizes in the tables, Class 2 and Class 3 were consolidated into one category ("teachers") representing all those eligible for certification.

Table 1

ARTS AND SCIENCES MAJORS*

Area Studies
- Area Studies

Biological Sciences
- Biology
- Botany
- Zoology
- Microbiology
- Biochemistry
- Marine Biology
- Other Biological Sciences

Physical Sciences
- Physics
- Chemistry
- Geology
- Other Physical or Earth Sciences

Fine Arts
- Art
- Music
- Drama
- Other Fine Arts

Letters
- English
- Philosophy
- Religious Studies
- Other Letters

Social Sciences
- Anthropology
- Criminology
- Economics
- Geography
- History
- Political Science
- Psychology
- Sociology
- Other Social Science

Mathematics
- Mathematics

Languages
- French
- German
- Spanish
- Other Foreign Language

* Higher Education General Information Survey (HEGIS) classifications

Table 2

EDUCATION MAJORS AND AREAS OF CERTIFICATION

Majors	Areas of Certification
Art Education	Art Education
Drama Education	Computer Science Education
Early Childhood Education	Early Childhood Education
Education (general)	Elementary Education
Elementary Education	English or Foreign Language Education
English Education	Health Education
Foreign Language Education	Junior High or Middle School
Mathematics Education	Mathematics Education
Middle School Education	Music Education
Music Education	Physical Education
Physical/Health Education	Reading Education
Reading Education	Science Education
Science Education	Secondary Education (general)
Secondary Education (general)	Social Studies Education
Social Science Education	Special Education
Special Education	

Classification of Courses

Each institution participating in the study was sent a "background information" query (Appendix B) designed to identify several key variables concerning the courses taken by their graduates. Each institution specified how transfer courses appeared on the transcript, course numbering system, the level of each course, how credit for advanced placement and CLEP was treated, and how credit and non-credit courses were differentiated on transcripts.

In addition to these general questions concerning format, each institution was asked for specific information concerning mathematics and English courses. For mathematics courses, each institution identified: which courses were developmental or remedial, and those that counted toward graduation; which courses required high school algebra I and II and geometry; which courses required only high school algebra I; and which mathematics courses were designed primarily for education majors. For English courses, each institution specified: which courses were developmental or remedial in nature, and those that counted toward graduation; which courses were the normal requirement for undergraduates; and which courses offered in the lower division included substantial writing or composition requirements.

The courses listed on each transcript were analyzed and classified based on the description given in the background information and in the college catalog of the institution from which the student had graduated. Any questions concerning the appropriate category for a particular course that could not be resolved by referring to the catalog were referred to the appropriate academic dean or faculty member at the institution involved. Once the appropriate subject area was identified, the courses intended primarily for freshmen or sophomores were classified as lower level, while courses intended for juniors and seniors were classified as upper level. Each institution participating in the study used a numeric course designation system which

remained consistent throughout its catalog. In most cases, 000-299 and 0000-2999 sequences designated courses at the lower level; 300-599 and 3000-5999 sequences designated courses at the upper level.

Only those courses which were awarded credit for graduation were evaluated. Total credit hours for graduation were determined by summation of all transferred course credits, credits by examination, and credit earned in the participating institution. In addition to recording the total number of earned course credit hours at graduation, the number of hours taken in specific categories for the subject areas considered in this study was also recorded on the coding form (see Appendix C). For institutions using quarter hours, these credits were later transformed into semester hours. This entire report, therefore, is reported in terms of semester hours. The term "average" is used throughout this report to denote the mean number of hours or percentages in each category for all graduates. The following subject areas and categories were included in the evaluation of each transcript.

Mathematics. Courses were placed into one of the following categories on the basis of the information supplied by the institutions: remedial; lower level requiring high school algebra I and II and geometry; lower level requiring only high school algebra I; lower level mathematics primarily for education majors; upper level mathematics; and upper level mathematics primarily for education majors. Lower level courses that required a background of high school algebra I and II and geometry were designated as level 1; those with a prerequisite of only high school algebra I were designated as level 2. Those courses designed for education majors are referred to as "mathematics for teachers." At the upper level, mathematics courses were classified as either regular mathematics or mathematics designed for education majors. Courses in statistics at the lower and upper levels were included in the totals for mathematics hours only if they were taught in the mathematics department. Computer science courses were given a separate category and classified as lower level or upper level.

English. Courses were classified into the following categories: remedial; regular with composition; regular without composition; upper level. The designation of courses as remedial and as including substantial composition requirements was made by the participating institutions.

Sciences. Courses were divided into four general disciplinary areas: the biological sciences; physics; chemistry; and other physical and earth sciences. In each of these general disciplines, the lower level courses were categorized in the following manner on the basis of catalog course descriptions: regular science courses; science courses for non-majors; and science courses primarily for education majors. Each of these categories was further divided into those courses requiring a lab and those not requiring a lab. At the upper level, courses were divided into the following categories: regular science with lab; regular science without lab; science courses for education majors with lab; and science courses for education majors without lab.

Liberal Arts and Humanities. Courses in the foreign languages, fine arts, and philosophy were classified as lower level, upper level, or upper level for education majors. The fine arts were defined as consisting of courses in music, art, and drama. A separate category entitled "other humanities" was created for courses in music history, music theory, art history, art theory, archaeology, classics, linguistics, religion, Latin, and Greek, with each course placed in one of three groups: lower level, upper level, or upper level for teachers.

Social Sciences. Courses in history were classified as lower level, upper level, and upper level designed primarily for teachers. The remaining social sciences--economics, sociology, political science, psychology, and other social sciences (anthropology and geography)--were classified as lower level or upper level.

Education. Education courses were classified into four basic categories: methods; practicum; student teaching; and other education. Each transcript was examined

for courses at the lower level and upper level in mathematics methods, science methods, and other methods. Methods courses were identified in the catalog as those courses which stress the method of presenting the material, the techniques of teaching, and the design and development of the curriculum, rather than the actual content being taught. At both the lower level and upper level, all courses, other than student teaching, that feature or require field or classroom experiences by the student with children and teachers in elementary or secondary schools were considered to be practicum courses.

The third category used to classify education courses was that of student teaching. Every institution included in this study required that graduates certified to teach complete a minimum number of hours in student teaching. These courses require supervised teaching by the student in an elementary or secondary school classroom. The final category used to classify education courses was "other education." This category includes the foundation courses, educational psychology when offered in the College of Education, and other education courses that did not fit in the other categories.

Transfer Credit. A substantial number of transcripts represent students who had transferred to the institutions included in the study. To obtain a fuller picture of the curriculum preparation taken by graduates of the selected institutions, transferred credits in mathematics were analyzed to the extent possible. This was done by examining course descriptions in the catalogs of those two-year and other transfer institutions that represented a substantial contribution to the total number of transfer students in the analysis.

For every transcript, transfer courses were recorded using the following categories: mathematics, English and literature, biological sciences, chemistry, physics, other physical and earth sciences, economics, history, political science, sociology, psychology,

other social sciences, languages, fine arts, humanities, and education and physical education. The total hours transferred in each of these categories were recorded and included in the final totals for credit taken at the lower level in each of the areas listed.

Advanced Placement and CLEP. Advanced placement and College Level Examination Program (CLEP) credit was recorded using the following categories: mathematics, English, history, science, social science, humanities, languages, and "other credit." These credits were included in the computation of the total credits taken at the lower level in each of these disciplines.

Other Courses. No courses outside of the arts and sciences, except education and physical education, were coded. For example, credits in business courses, while included in the total credits earned for graduation, were not coded for this study.

CHAPTER III

CHARACTERISTICS OF THE POPULATION

Transcripts

A total of 6,054 transcripts were coded initially. Of this total, 6,043 transcripts were usable and were processed for this study; 2,760 were classified as arts and sciences majors not certified to teach (the arts and sciences graduates) and 3,283 were classified as education majors or arts and sciences majors certified to teach (teachers). Of the institutions participating in this study, the number of cases ranged from 217 to 561, with the following distributions:

Number of Cases	Number of Institutions
200-299	5
300-399	7
400-499	3
500-575	2

The average number of cases per institution was 356. The average number of arts and sciences graduates and teachers per institution was 162 and 194, respectively.

When this study was presented to the participating institutions, they were requested to select those arts and sciences graduates and teachers that fit the HEGIS categories used to form the classification criteria for the analysis of the transcripts. Due to sampling problems, illegible transcripts, and difficulties in the initial selection process at some of the institutions, the final totals for the arts and sciences graduates and teachers differed slightly, resulting in a higher number of teachers. The breakdown of the teachers and arts and sciences graduates into finer categories is shown in Chapters IV and V.

Total Credit Hours

The average total credit hours at graduation were 135 for arts and sciences graduates and 142 for teachers. The average number of lower level hours that were coded (all courses were not coded) was 82 for arts and sciences graduates and 74 for teachers. When comparing the total courses coded at the upper level, the average

was 39 for arts and sciences graduates and 60 for teachers. Many of the courses offered for the major in education are at the upper level because students are generally admitted to the College of Education at the end of their sophomore year. This helps to account for the differences between arts and sciences graduates and teachers when the upper level coursework is compared. A more detailed examination of the distribution of lower and upper level credits by subject for each group is presented in later sections.

Transferred Credits

Of the total group of 6,043 transcripts processed, 3,545 had some transfer credit included in the total hours at graduation. Of the group of students transferring credit, 1,575 were arts and sciences graduates and 1,970 were teachers. The patterns regarding transferred credits are summarized in Table 3.

Table 3

TRANSFER PATTERNS OF GRADUATES

	Teachers	Arts and Sciences
No Transferred Credits	1,313	1,185
Transferred Credits	1,970	1,575
Percent of Students Transferring Credit	60%	57%
Average Number of Hours Transferred	39.1	38.7
Average Percent of Total Credits Transferred*	27%	28%

* In this and following tables, the percentages were rounded to whole numbers before averaging.

Transferred credits include those from two-year and other four-year institutions that a student may have attended. There were no significant differences between teachers and arts and sciences graduates with respect to transferred credits. The average number of hours transferred for the two groups is almost equal: 39.1 hours for teachers

and 38.7 for arts and sciences graduates. The difference in the proportion that transferred credits represent of the total credit earned for graduation is minimal. Tables 4 and 5 summarize the distribution of graduates in each group by the amount of transferred credits (Table 4) and by the percentage of the total credit at graduation that was transferred (Table 5).

Table 4

DISTRIBUTION BY NUMBER OF TRANSFERRED HOURS

Number of Transferred Hours	Teachers (N = 1,970)	Arts and Sciences (N = 1,575)
1-11	24	22
12-35	20	26
35-60	32	29
61-above	23	22
Average Hours Transferred	39.1	38.7

Table 5

DISTRIBUTION BY PERCENT OF TOTAL CREDITS TRANSFERRED

Percent of Total Credits Transferred	Teachers (N = 1,970)	Arts and Sciences (N = 1,575)
1-15%	33	32
16-30%	18	22
31-50%	42	34
51% -above	7	12
Average Percent of Total Credits Transferred	27	28

SAT and ACT

Of the total 6,054 cases, SAT scores were submitted for only 1,401 cases, and ACT scores for only 1,002 cases. Therefore, any analysis of SAT scores or ACT scores comparing arts and sciences graduates with teachers should be interpreted with caution.

The overall total SAT (math and verbal combined) averaged 962 (out of a possible range from 400 to 1600). The arts and sciences graduates had an average SAT score of 998; the average SAT score of the teachers was 927. These scores were for students who graduated from college and, as should be expected, were higher than the national average of 890* for all high school students taking the SAT and the average 854 SAT score** for all high school students in the South.

A comparison of the total SAT scores for arts and sciences graduates and teachers is presented in Figure 1. Nine percent of the arts and sciences graduates scored below 800, while 19 percent of the teachers scored below 800. At the higher end, 11.8 percent of the arts and sciences graduates scored at or above 1,200 versus only 4.4 percent of the teachers. Roughly half of the arts and sciences graduates scored at or above 1,000 on the SAT, while only 30 percent of the teachers scored at or above 1,000.

For those with ACT scores, the arts and sciences graduates averaged 22.4, while the average ACT score for teachers was 19.3; ACT scores can go as high as 36. As in the previous comparison of SAT scores, these ACT scores are higher than national averages for all high school students taking the ACT (average ACT 18.5) and for all high school students in the South taking the ACT (average ACT 17.1).*** In comparing

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* Source: National College-Bound Seniors, 1979. College Entrance Examination Board, 1979.

** Source: Southern College-Bound Seniors, 1979. College Entrance Examination Board, 1979.

*** Source: American College Testing Service, National ACT scores, 1979-80, Southern ACT scores, 1980-81.

ACT scores between the two groups, 10 percent of the arts and sciences graduates scored at or below 15, while 18.4 percent of the teachers scored at or below 15. At the other extreme, 14.6 percent of the arts and sciences graduates scored at or above 28, while only 2.6 percent of the teachers scored at this level or above. Figure 2 presents these ACT comparisons.

Figure 1

DISTRIBUTION OF SAT SCORES

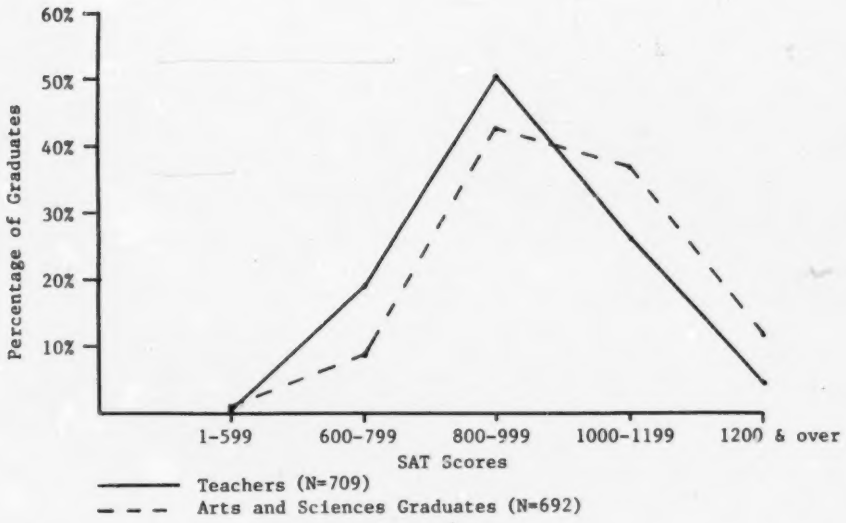
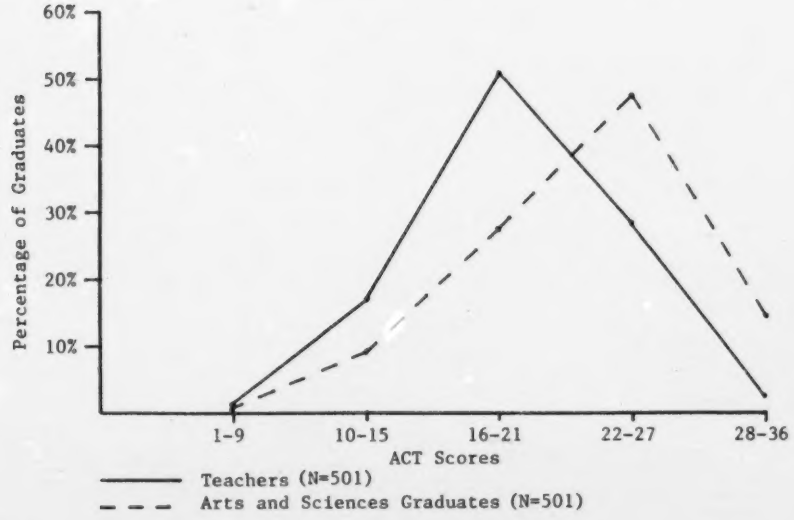


Figure 2

DISTRIBUTION OF ACT SCORES



CHAPTER IV

GENERAL EDUCATION

For the purpose of this study the "general education component" of the graduates' transcript is defined as the credit hours they completed in each of the five major divisions of the arts and sciences curriculum*--mathematics, natural science, English, social sciences, and other liberal arts (including fine arts, languages, philosophy, and other humanities). In calculating the average credit hours in each of these major divisions, graduates who had a major that fell within that division were excluded. For example, to calculate the average credit hours in English taken by the graduates, all English majors and English education majors were first excluded. Similarly, to calculate the mean credit hours graduates took in the natural sciences, all natural science majors and science education majors were first excluded. (For the exact exclusion of majors relative to courses taken see Appendix D.)

The above procedure was followed since on the basis of a transcript, it is impossible to differentiate which courses graduates took to satisfy requirements for a major and which were taken to satisfy general education requirements. For example, which courses taken by an English major satisfy the general education requirement all students must meet and which courses are taken to satisfy the major's requirements? Another way of considering general education is that while English courses contribute to the well-roundedness or general education of a biology major, biology courses represent background for the English major. The process which excludes majors in a division of arts and sciences (when that division is under analysis as general education) produces a composite view of what students are taking as general education in disciplines other than their

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* This includes transfer and advanced placement credits

own majors. This approach more closely describes course-taking patterns to meet general education requirements than would be the case if majors in disciplines had been included.

The procedure for including and excluding graduates in calculation of the general education statistics needs further explanation. For the arts and sciences graduates, when science-taking patterns were examined, 677 science majors were excluded; for statistics on English-taking, 163 English majors were excluded. The same procedure was followed for mathematics, social science, and other liberal arts. Since all arts and sciences graduates, by definition, majored in one of the five divisions, they are all included in the analysis of the respective four divisions in which they did not major. (See Appendix E for number of graduates included in each category.)

For the teachers, those persons with a major in the division of the general education under examination were also excluded; for example, English and English education majors were not included in the examination of English-taking patterns. Forty percent of the teachers had majors within one of the arts and sciences disciplines, and thus were excluded in one of the five major divisions of general education. The remaining 60 percent of the teachers did not major in a subject field within the arts and sciences and, therefore, are included in all five divisions of general education. This latter group of teachers majored in elementary education, special education, physical education, etc.

The average total credit hours for teachers and arts and sciences graduates in each general education area are shown in Table 6. This table summarizes the total hours taken in each area, including lower and upper level courses. On the average, teachers took fewer general education credits than arts and sciences graduates, and, except in the social sciences, general education was a lower proportion of total credits for teachers than for arts and sciences graduates.

Table 6

AVERAGE GENERAL EDUCATION HOURS; PERCENT OF TOTAL CREDIT

	Teachers			Arts and Sciences		
	Number	Credit Hours	Percent of Total Credits	Number	Credit Hours	Percent of Total Credits
Mathematics	3,127	6.0	4.2%	2,639	7.2	5.2%
Science	3,158	11.6	8.2	2,083	12.2	9.1
English	2,992	11.3	8.0	2,597	11.8	8.8
Social Science	3,008	21.6	15.3	1,541	20.4	15.0
Other Liberal Arts	2,827	11.4	8.1	2,202	17.8	13.4

Table 7 shows average credit hours taken by teachers and arts and sciences graduates in lower level general education courses in each of the major divisions. The pattern is quite similar to total general education hours. To the extent that general education requirements are usually described in terms of freshman or sophomore courses, the lower level courses in Table 7 may be more representative of general education than the results combining lower level and upper level courses.

Table 7

AVERAGE LOWER LEVEL GENERAL EDUCATION HOURS; PERCENT OF TOTAL CREDIT

	Teachers		Arts and Sciences	
	Credit Hours	Percent of Total Credits	Credit Hours	Percent of Total Credits
Mathematics	5.5	3.8%	6.7	4.9%
Science	10.9	7.6	11.3	8.3
English	10.4	7.3	10.2	7.5
Social Science	18.6	13.1	16.7	12.4
Other Liberal Arts	9.4	6.6	15.4	11.4

For lower level general education courses, the arts and sciences graduates, as compared to the teachers, had substantially more credit hours in mathematics and other liberal arts, and a minor advantage in science and English hours. Teachers averaged more lower level credits in the social sciences.

The following sections detail findings for each of the five academic divisions of general education as well as the general education credits for elementary and early childhood teachers.

General Education: Academic Divisions

Mathematics

The average number of "general education" mathematics credits earned by the non-major graduates is shown in Table 8. On the average, teachers completed 6.0 hours in mathematics; arts and sciences graduates, 7.2 hours. Of the mathematics hours teachers complete, on the average, one-third consists of coursework designed for teachers, rather than for all arts and sciences students. Mathematics credits averaged approximately 5 percent of total credits earned for arts and science graduates and 4 percent for teachers. Included in this calculation, as in other general education data that describe the number of credit hours, are transferred and advanced placement credits in the discipline.

Table 8

GENERAL EDUCATION: MATHEMATICS TAKEN

	Teachers (N = 3,127)	Arts and Sciences (N = 2,639)
Average Total Hours in Mathematics Credits	6.0	7.2
Average Total Hours in "Teacher Mathematics"	2.0	**
Average Total Lower Level Hours in Mathematics	5.5	6.7
Average Percent Mathematics Credit at Level 1* or above	22%	53%
Average Percent Mathematics Credits of Total Credits	4.2%	5.2%
Percent Who Earned at Least 12 Hours in Mathematics	7%	18%
Percent Who Took Upper Level Mathematics Courses	15%	8%

* Level 1: Prerequisite of 2 years high school algebra and one year geometry
** Less than one-tenth hour

The higher average of total mathematics hours for arts and sciences graduates results from a greater clustering at the upper end of the mathematics credits--18 percent

took at least 12 or more hours, compared to only 7 percent of the teachers. However, a lower proportion of the teachers took no mathematics courses at all (7 percent) than is the case for the arts and sciences graduates (11 percent) (see Table 9).

A higher proportion of the teachers (15 percent) completed upper level mathematics courses than the arts and sciences graduates (8 percent). This reflects the fact that many teachers complete two courses of mathematics designed especially for teachers, which in some institutions are offered at the upper level.

There is considerable variation among institutions on the outcomes of mathematics-taking patterns for teachers and arts and sciences graduates. At 12 institutions, the arts and sciences graduates completed a higher average number of credits in mathematics than did the teachers; but the reverse was true at the remaining five institutions. The range in average total credits in mathematics for teachers in the 17 institutions was from 3.5 hours to 6.9 hours; for the arts and sciences graduates, from 5.1 hours to 8.6 hours.

Mathematics is a discipline in which courses often depend on completion of pre-requisites, which permits the arrangement of mathematics courses in a hierarchy of difficulty levels. Thus, this discipline presents a unique opportunity to ascertain the extent to which students take remedial or beginning courses, as opposed to more advanced-level college work.

As described more fully in Chapter II, all freshman and sophomore mathematics courses were classified as follows:

Remedial or developmental (for credit; non-credit were not coded)

Level 1 course	(college mathematics course with a prerequisite of at least two years of high school algebra and 1 year of geometry)
Level 2 course	(other mathematics courses offered which require less preparation than for a Level 1 course)
"Teachers' math"	(mathematics courses designed primarily for teacher education majors at lower and upper levels)

The results, following the above classification scheme, are summarized in Table 9.

Table 9

NUMBER AND PERCENT OF GRADUATES
BY LEVELS OF MATHEMATICS TAKEN

	Teachers (N = 3,127)		Arts and Sciences (N = 2,639)	
	Number	Percent	Number	Percent
1. No Mathematics Courses in College	220	7.0	280	11.0
2. Remedial, and No Other Mathematics Course	105	3.0	74	3.0
3. Remedial Mathematics and/or Level 2+ Mathematics Course(s)	338	11.0	313	12.0
4. "Teachers' Mathematics" Course(s)	771	25.0	14	.5
5. Remedial and/or "Teachers' Mathematics," and/or Level 2+ Mathematics Courses	1,334	43.0	339	13.0
6. Level 1* and/or Upper-level Mathematics	489	16.0	1,157	44.0

* Level 1: Prerequisite of 2 years high school algebra and 1 year geometry
\+ Level 2: Requires less preparation than for Level 1

The above categories are not additive because some graduates appear in more than one category. Each category refers to graduates who took only a combination of courses within that pattern, and no other courses. Categories 2 through 6 include credits earned at the participating institution only.

The finding that a substantial proportion of students complete college without ever taking a mathematics course seems astounding. The fact that more arts and sciences graduates than teachers escape mathematics altogether indicates that there may be somewhat greater control over teachers' general education than is the case for arts and sciences majors. One explanation for the fact that college graduates manage to avoid mathematics courses altogether is that some colleges allow divisional requirements that include mathematics to be met by substitute courses, for example, logic.

Three percent of both groups of graduates took no mathematics at the four-year institution, other than a remedial course for which credit was granted. Categories 2, 3, 4, and 5 describe the large group of students who took remedial, "teachers' math," and/or Level 2 mathematics courses only at the four-year institution.

(Courses which may have been taken as transfer or AP credits were not included in these categories.) Examples of the college catalog descriptions for these types of math courses are:

(A Level 2 course)

Basic Concepts of Mathematics (3) I. Designed primarily for liberal arts students not intending to take advanced courses in mathematics. Mathematics is approached from a cultural-historical point of view with emphasis on ideas and their significance rather than on manipulative processes or computations. Topics from number theory, algebra, geometry, topology, and analysis are included.

("Teachers' Math" courses)

201 Understanding Arithmetic (3) I, II. Open only to students seeking elementary certification. Concepts stressed over manipulation. Sets and functions, whole numbers, integers, numeration, elementary number theory.

202 Understanding Elementary Mathematics (3) I, II. Prerequisite: MAT 201. Continuation of MAT 201: rational numbers, decimals and real numbers, geometry, measurement, metric system.

Only 16 percent of the teachers and 44 percent of the arts and sciences graduates completed one or more college-level mathematics courses having prerequisites of algebra I and II and geometry and took no courses in remedial, level 2, or teachers' mathematics. For teachers, only 22 percent of their total mathematics credits represent college-level mathematics, as compared to 53 percent for arts and sciences graduates.

As absymal as the results are in terms of the low proportion of graduates who take college-level work in one discipline in which it is possible to ascertain the level of general education course content, even these findings may overstate the extent to which graduates really took college-level mathematics. Courses were classified in this analysis according to how the universities classified their courses, but there is some evidence that these classifications may not have been correct. For example, when one course was questioned because its catalog description appeared to be remedial rather than Level 2 (as the university had designated it for the purpose of this study), the university responded that, indeed, in the future that particular course would no longer be given for credit, and the next higher level course would become the "Level 2 course."

A possible offset against the overstating of mathematics courses may be the exclusion of statistics courses taken outside of the mathematics department. At six of the 17 institutions statistics departments are separate from the mathematics departments, and to the extent that graduates may have taken courses in those departments, the total average mathematics course-taking may be understated. (The exclusion of statistics courses taken outside of the mathematics department was adopted in the coding scheme in order to exclude business statistics offered in business administration programs.)

The characteristic of mathematics course descriptions which permits courses to be categorized by levels of advancement made it possible to make some determination of the level of difficulty of transferred mathematics courses. For five institutions transferred mathemati .s courses' descriptions were checked from at least the two colleges transferring the most students to each of the five institutions. For the most part these feeder colleges were community colleges, although a few four-year institutions also provided substantial transfers to the institutions in this study. These five institutions yielded 103 transcripts from their heaviest feeder institutions for graduates with at least one transferred mathematics course. The distribution of these 103 graduates with transferred mathematics credit is as follows:

	Number of Graduates with Transferred Mathematics Course(s)	Graduates Who Transferred at Least One Level 1 Course	
		Number	Percent
Teachers	59	12	20%
Arts and Sciences	44	28	64

Thus, for transferred credits, the pattern is similar to that found in the senior colleges: neither group is taking much college-level mathematics, and there is a greater likelihood of arts and sciences graduates taking college-level mathematics courses than there is for future teachers.

Other mathematics courses transferred from feeder institutions were remedial mathematics, Level 2 courses, and "teachers' mathematics" courses. In one participating institution, inconsistencies were found. For some graduates a course in intermediate algebra that required high school algebra I was given credit for transfer while for other graduates this was not allowed. The decision did not seem to hinge on the grade earned nor on what other mathematics courses were taken in the two-year institution.

A surprising finding in the analysis of transferred mathematics courses is the large number of teachers whose mathematics courses in the community college were of the type suggested for preparation for elementary education majors. An example of the catalog description of such a course follows:

> Mathematics for Elementary Education: Sets, system of cardinal numbers, numeration systems, elementary number theory, fractions and rational numbers, real number system, elementary logic, intuitive geometry, measurement, introduction to statistics, introduction to probability.

Other types of mathematics courses which were transferred for credit are described as:

> Consumer Mathematics: What is unit pricing? What is the simple and compound interest?
>
> Math and Mysticism: What does the ancient Chinese book of devination have in common with modern electronic computers? Can you really find your true mate by the use of numerology? What is 'sacred' geometry? . . .
>
> Mathematics and Art: An examination of how mathematics can be used to generate artistic designs and figures, such as string art, modular designs, and tessellations . . . .

"Modern math" is a popular course title that appears in college catalogs and may be a hangover from the "relevance" movement of the late 1960s. A typical catalog description of modern math is, "mathematics and its spirit and use--appreciation of the art, history, beauty, and application of mathematics. Topics will include perspective and symmetry, number theory, computer science, charts, etc."

The examination of transferred math credits provides additional insights regarding the preparation of college graduates. Some seniors fulfill mathematics requirements during their last year by taking courses at a two-year college. In some cases, such

a transferred course is a make-up for a similar course that was failed in the senior college. For teachers, the most frequently transferred mathematics course from two-year colleges is a "teachers' math" course.

Science

Arts and sciences graduates took only slightly more science hours than teachers: 12.2 average total hours for the former as compared to 11.6 hours for the latter (see Table 10). For both groups, science credits were earned primarily in lower-level courses.

Table 10

GENERAL EDUCATION: SCIENCE TAKEN

	Teachers (N = 3,158)	Arts and Sciences (N = 2,083)
Average Total Hours in Science Credits	11.6	12.2
Average Total Upper-Level Hours	.7	.9
Average Percent Science Credits of Total Credits	8.2	9.1
Average Total Hours in Science with Laboratory (non-transfer)	6.0	7.0
Average Total Hours in Biological Sciences*	6.1	5.3
Average Total Hours in Physics and Chemistry*	1.8	3.3
Average Total Hours in Other Sciences (Astronomy, Earth Science, etc.)*	3.6	3.5

* Average for individual disciplines do not add to total for all sciences combined because numbers of non-major graduates vary for individual disciplines.

Table 10 also shows that there are no major differences in the science course-taking patterns for the two groups, except for the type of courses taken. Biology was the most frequently taken natural science by both groups. However, arts and sciences graduates took almost twice as high an average number of hours in physics and chemistry as did teachers, although these are low for both groups. The latter were more likely to take their science credits in the biological sciences; geology and other earth/space science courses also attracted slightly more teachers than arts and sciences graduates. For both groups approximately half of the average course credits in the science disciplines included a laboratory component. This number is understated, however, because no distinction was made between lab and non-lab courses for transferred science credits. The range in the average total science hours taken at the 17 institutions is from 8.6 to 15.0 for teachers, and from 8.0 to 17.4 for arts and sciences graduates.

The percentage of graduates who never took a course in one of the component sciences, or in any science course at all, is shown in Table 11. A minute proportion of graduates did not take any science (.5 percent of the teachers and 1 percent of the arts and sciences graduates). Half of the arts and sciences graduates and two-thirds of the teachers took no chemistry or physics; one-fourth of the arts and sciences graduates and 11 percent of the teachers took no biological science coursework.

Table 11

PERCENT OF GRADUATES NOT COMPLETING
A SINGLE COURSE IN SCIENCE DISCIPLINES

	Teachers	Arts and Sciences
Chemistry and/or Physics	68%	54%
Other Sciences (Astronomy, Earth Science, etc.)	34	41
Biological Sciences	11	25
Any Science	*	1

PERCENT OF GRADUATES COMPLETING
AT LEAST 9 HOURS IN SCIENCE DISCIPLINES

	Teachers	Arts and Sciences
Biological Sciences	13%	12%
Other Sciences (Astronomy, Earth Science, etc.)	6	7
Chemistry and/or Physics	4	11

* Less than 1 percent

English

The difference in English course-taking patterns between the two groups of graduates is slight, but consistently in favor of the arts and sciences graduates. As shown in Table 12, on the average, the latter took slightly more English credits, more of these were at the upper level, and their English hours as a percentage of total credits exceeded those of the teachers. The range in the average total English hours taken at the 17 institutions differs considerably: 8.1 to 14.3 for teachers, and 8.7 to 14.5 for arts and sciences graduates.

Table 12

GENERAL EDUCATION: ENGLISH TAKEN

	Teachers (N = 2,992)	Arts and Sciences (N = 2,597)
Average Total Hours in English Credits	11.3	11.8
Average Total Upper Level Hours in English	.9	1.6
Average Percent English Credits of Total Credits	8.0%	8.8%
Average Credit Hours in Composition Courses at Participating Institutions	3.2	3.5
Number (and Percent) of Graduates Who Earned Credits for Remedial English Courses at Participating Institutions	119 (4%)	65 (2%)
Number (and Percent) of Graduates Who Took Upper Level English Course	513 (17%)	687 (26%)
Number (and Percent) of Graduates Who Took No Regular English Courses at Participating Institution	667 (22%)	401 (15%)

Since practically all freshmen and sophomores are expected to take two English courses that include a substantial composition component, one might question statistics showing that the average credit hours earned in composition courses approximates only 3 semester hours. The explanation is that for students who transferred their lower-level English courses from other institutions, it was not possible to determine from the transcripts whether their transferred English courses did, in fact, represent composition courses. To the extent that this might be so, the average number of composition courses would more closely approximate the expected six hours.

A very high proportion of both groups took no upper level English courses: 83 percent of the teachers and 74 percent of the arts and sciences graduates. English

courses identified as "remedial" by the participating four-year institutions earned credit for 119 teachers and 65 arts and science majors; on the average, these graduates earned 3.0 hours of credit at this level of English coursework. These statistics do not include remedial English coursework which may have been transferred for credit or courses for which no credit was given in the four-year institutions. To the extent that any of the transferred English credits may have represented remedial work, the statistics on remedial English-for-credit may be understating the degree to which this occurs.

Fifteen percent of the arts and sciences graduates and 22 percent of the teachers took no regular English courses at the participating institution, having transferred their English requirements or having taken only remedial English classes at the senior institution.

Social Studies

The social sciences represent the one division of general education in which the teachers earned a higher average of total hours than was the case for the arts and sciences graduates. As shown in Table 13, teachers took an average of 21.6 hours in the social sciences, as compared to 20.4 hours for the arts and sciences graduates. The range in the average total social science hours taken at the 17 institutions is from 16.0 to 26.8 hours for teachers and from 17.0 to 27.2 hours for arts and science graduates.

The advantage in hours for the teachers stems from the higher number of hours they take in psychology (6.0 hours) as compared to the arts and sciences graduates (4.6 hours).* In all other individual disciplines, the arts and sciences graduates earned

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* The higher average hours for teachers in psychology credits reflect requirements in developmental psychology courses when these are offered by the psychology department. In seven institutions, educational psychology is housed in the College of Education, and was coded as an education course.

Table 13

GENERAL EDUCATION: SOCIAL SCIENCES TAKEN

	Teachers (N = 3,008)	Arts and Sciences (N = 1,541)
Average Total Hours in Social Sciences Credits	21.6	20.4
Average Upper-Level Hours in Social Sciences	3.0	3.7
Average Percent Social Sciences Credits of Total Credits	15.3%	15.0%
Average Credit Hours*		
History	6.4	7.1
Political Science	2.2	4.1
Psychology	6.0	4.6
Economics	.9	2.0
Sociology	3.0	3.7
Other Social Sciences (anthropology, geography, etc.)	3.2	3.7

* Average for individual disciplines do not add to total for all social sciences combined because numbers of non-graduates vary for individual disciplines

more hours than the teachers. The relative advantage of the arts and sciences graduates is particularly apparent in the political science and economics disciplines, although in absolute numbers of hours these two disciplines ranked as the least popular among the social sciences. History was the most popular social science for both groups. "Other social sciences" includes anthropology and geography.

The arts and sciences graduates completed a slightly higher average number of upper level hours in the social sciences than the teachers did. Approximately one-half of both the teachers and the arts and sciences graduates took no upper level social science courses.

The difference in the popularity of the various social science disciplines among teachers and arts and sciences graduates is illustrated in Table 14. This table shows the proportion of graduates who never took a course in one of the disciplines. A disquieting finding is that almost half of the teachers took no course in political science. To the

extent that American government is taught as a political science instead of a history course, the lack of acquaintance with subject matter in that area among teachers seems disastrous.

Table 14

PERCENT OF GRADUATES NOT COMPLETING
A SINGLE COURSE IN SOCIAL SCIENCE DISCIPLINES

	Teachers	Arts and Sciences
Economics	75%	59%
Political Science	46	38
Other Social Sciences	42	40
Sociology	30	33
Psychology	12	23
History	6	9

PERCENT OF GRADUATES COMPLETING AT LEAST 9 HOURS
IN SOCIAL SCIENCE DISCIPLINES

	Teachers	Arts and Sciences
History	20%	25%
Psychology	27	16
Other Social Sciences	12	15
Sociology	4	12
Political Science	1	11
Economics	*	4

* Less than 1 percent

The second part of the table shows the percentage of graduates who took at least nine semester hours in one of the disciplines. History is at the top of the list for the arts and sciences graduates, and psychology for the teachers.

Other Liberal Arts

Other liberal arts refers to courses taken in philosophy, foreign languages, fine arts, and other humanities. (Other humanities include classic languages, religious studies, music and art appreciation and history, music theory, and other letters.)

The teachers took substantially less work in other liberal arts than the arts and sciences graduates. As shown in Table 15, the average total credits earned by teachers in other liberal arts was 11.4 hours, as compared to 17.8 for arts and sciences graduates. This represents 8.1 percent and 13.4 percent, respectively, of total credit hours for the two groups of graduates. The range in the average hours taken in other liberal arts at the 17 institutions is from 6.0 to 19.8 hours for teachers, and from 10.2 to 25.0 hours for arts and sciences graduates.

Table 15

GENERAL EDUCATION: OTHER LIBERAL ARTS TAKEN

	Teachers (N = 2,827)	Arts and Sciences (N = 2,202)
Average Total Hours in Other Liberal Arts Credits	11.4	17.8
Average Total Upper-Level Hours in Other Liberal Arts	1.1	2.3
Average Percent Other Liberal Arts Credits of Total Credits	8.1%	13.4%
Average Credit Hours*		
Fine Arts	4.3	2.3
Foreign Languages	2.0	7.9
Philosophy	.7	2.1
Other Humanities**	5.8	6.3
Percent of Graduates with no Other Liberal Arts Credits	7.5%	2.5%

* Averages for individual disciplines do not add to total for all other liberal arts combined because numbers of non-major graduates vary by disciplines

** Art and music appreciation and history, music theory, classic languages, religious studies, and other letters

Only in one component discipline of other liberal arts did teachers take more courses on the average than the arts and sciences graduates: fine arts. (For the purpose of this report, fine arts includes the applied courses, while art and music appreciation

and history and theory of music are considered as "other humanities.") This may reflect the fact that elementary teachers tend to take art courses to prepare for classroom applications.

In all the other component disciplines of other liberal arts, the arts and sciences graduates took more courses than was the case for teachers. The difference is most marked for foreign languages, with an average of 7.9 hours earned by arts and sciences graduates, as compared with only 2.0 hours on the average for teachers.

The proportion of both groups of graduates who completed a college curriculum without ever taking a course in one of the component liberal arts disciplines is shown in Table 16. For both teachers and arts and sciences majors, philosophy is a course that was usually lacking. Three-fourths of the teachers and almost one-third of the arts and sciences graduates took no foreign language in college.

Table 16

PERCENT OF GRADUATES NOT COMPLETING
A SINGLE COURSE IN OTHER LIBERAL ARTS DISCIPLINES

	Teachers	Arts and Sciences
Philosophy	78%	52%
Foreign Languages	74	31
Fine Arts	40	63
Other Humanities	25	19

PERCENT OF GRADUATES COMPLETING
AT LEAST 9 HOURS IN OTHER LIBERAL ARTS DISCIPLINES

	Teachers	Arts and Sciences
Other Humanities	23%	28%
Fine Arts	20	7
Foreign Languages	8	48
Philosophy	*	3

* Less than 1 percent

Table 16 also illustrates the proportion of both groups of graduates who took at least nine hours of credit in a discipline encompassed under other liberal arts. The category "other humanities," which includes art and music appreciation, had the highest participation rate for teachers; foreign languages was highest for arts and sciences graduates. The fine arts (in an applied sense under the definition in this study) attracted the lowest participation of arts and sciences graduates among the disciplines in this category.

Humanities

Since this study of transcripts was made with partial funding by the National Endowment for the Humanities (NEH), it is important to determine the extent to which graduates completed coursework in the humanities. For this purpose, "humanities" has been defined as follows: courses in English, history, foreign languages, philosophy, religious studies, classics, art and music history and appreciation, music theory, and other letters. This definition closely follows the NEH definition of humanities, which excludes applied fine arts but includes aesthetic study of the fine arts.

Again, it should be stressed that in determining coursework in these areas for both arts and sciences graduates and for teachers, those graduates who majored in any one of the component disciplines of the humanities were excluded. Thus, this represents the general education in the humanities for non-humanities majors. The differential distribution of teachers and arts and sciences graduates concentrating in humanities disciplines does not affect the data in this section, since they were excluded.

As seen in Table 17, teachers took considerably less work in humanities than did arts and sciences graduates (26.1 hours on the average for teachers, as compared to 34.0 hours for the arts and sciences graduates). Also, humanities comprised a lower percentage of total credits for the teachers than was the case for the arts and sciences graduates. While humanities coursework represented at least one-fourth of college

credits for 52 percent of the arts and sciences graduates, this proportion of study in the humanities was reached by only 17 percent of the teachers. A very small proportion of both groups completed less than 12 hours in humanities courses (6 percent of the teachers and 3 percent of the arts and sciences graduates). Since English is universally required for all students, it is likely that this small group of graduates with so little coursework in the humanities finished the English requirements and took almost no other humanities courses.

Table 17

GENERAL EDUCATION: HUMANITIES TAKEN

	Teachers (N = 2,731)	Arts and Sciences (N = 2,315)
Average Total Hours in Humanities	26.1	34.0
Average Total Upper-Level Hours in Humanities	2.5	5.0
Average Percent Humanities Credits of Total Credit Hours	18.3%	25.3%
Average Credit Hours*		
English	11.3	11.8
History	6.4	7.1
Foreign Languages	2.0	7.9
Philosophy	.7	2.1
Other Humanities**	5.8	6.3

* Averages for individual discipliness do not add to total for humanities because numbers of non-major graduates vary by disciplines

** Art and music appreciation, music theory, classic languages, religious studies, and other letters

General Education: Elementary Teachers

It is particularly important to focus on the general education of elementary teachers since for most of them this constitutes their subject area preparation. In most states, certification standards and colleges do not require elementary or early childhood teachers to complete an academic major. Rather, these teachers take courses in each of the major academic divisions, in addition to education courses.

This analysis focuses on the general education of 1,251 elementary or early childhood teachers. All of these teachers are represented in the averages for each discipline.* Their average general education credit hours, and the percentages that these hours represent of total credits, are shown in Table 18. General education--defined in this

Table 18
GENERAL EDUCATION CREDITS TAKEN BY
ELEMENTARY AND EARLY CHILDHOOD TEACHERS
(N = 1,251)

	Average Hours		Average Percent of Total Credits (136.9 = total credits)
Mathematics		7.7	5.7%
Science		12.1	8.8
Biology	6.2		
Chemistry/Physics	1.3		
Other Science	4.6		
English		12.2	8.9
Social Science		23.6	17.3
History	6.9		
Political Science	2.6		
Psychology	5.5		
Economics	.9		
Sociology	3.2		
Other Social Science	4.5		
Other Liberal Arts		13.7	10.0
Languages	1.8		
Fine Arts	7.1		
Philosophy	.6		
Other Humanities	4.2		
Total General Education		69.3	50.7

* The averages for the major divisions of general education for these teachers are additive, which is not the case for all teachers and for arts and sciences graduates.

study as including all academic courses that were earned from the freshman year to graduation--constitutes approximately half of the total program of elementary teachers.

Although it is to be expected that in the early years the curriculum of elementary school pupils will concentrate primarily on language and numerative skills, their teachers concentrate their general education in the social sciences. More coursework is completed in the social sciences than in mathematics and English combined.

Total general education credits for elementary teachers exceed those earned by all non-major teachers in each major academic division, and those of the non-major arts and sciences graduates in mathematics, English, and social sciences. The credits in science earned by elementary teachers are nearly equal to those earned by arts and sciences graduates, The total hours include an average of 7.5 hours of elementary teachers' credits in academic courses designated primarily for teachers. The distribution of these "teachers' courses" is as follows:

Of the average total hours in mathematics, 3.7 hours are in "teachers' mathematics";

Of the average total hours in science, 1.2 hours are in "teachers' science";

Of the average total hours in fine arts, 2.6 hours are in "teachers' fine arts."

In the natural sciences, elementary teachers tend to concentrate in biology, followed closely by "other physical sciences" (geology is a course frequently taken in that category).

In the social sciences, elementary teachers tend to take history and psychology, rather than political science and economics. Some of the psychology credits represent educational psychology, since for 10 of the 17 participating institutions, this course is offered in the academic psychology department (and therefore is counted as an academic course) rather than in the College of Education (where it would be considered an education course). "Other social science," which follows history and psychology in popularity, represents primarily geography and cultural anthropology--two courses often found on teachers' transcripts.

The most frequently taken discipline in the "other liberal arts" division is fine arts, of which 2.6 hours represent the average credits earned in art courses designated primarily for teachers. "Other humanities" contributes an average of 4.2 hours; art and music appreciation and religious studies are courses that frequently show up in this category on teachers' transcripts. Foreign language and philosophy courses are conspicuously absent.

General Education: Catalog Requirements and What Students Take

To place the findings on general education in perspective, it is valuable to examine the general education requirements as stated in the college catalogs of the 17 participating institutions, and to compare these to the findings of the transcript study.

All 17 institutions to some extent specify their general education requirements. In some cases these vary, depending on the particular college within the institution or the degree sought. Where such variations exist, this analysis includes the requirements for the bachelor of arts degree rather than the bachelor of science.

For the 17 institutions, the proportion that general education constitutes of the total minimum required credit hours for graduation ranges from as little as 25 percent to as high as 56 percent. The average prescribed general education component represents 36 percent of the average minimum graduation credits.

A direct comparison between the transcript study/general education findings and the catalog requirements is not possible. However, comparing lower level general education credits with the stated requirements provides one basis for analysis. The average percentages of lower level credit hours that non-majors take in each of the five major academic divisions of general education* (Table 7, page 19) are not additive,

*General education excludes physical education and health, as well as electives outside of the arts and sciences disciplines that are sometimes included as satisfying general education requirements.

since the group of non-majors in each of the five divisions is a different set of graduates. If the majors (who are excluded in the general education statistics [Table 6, page 19] in the respective divisions to which they pertain) can be assumed to have the same general education course-taking patterns as the non-majors, the general education courses completed by both groups exceed the minimum percentage specified by the college catalogs. Arts and sciences graduates exceed the minimum by more credits than teachers do (45 percent for the arts and sciences, 39 percent for the teachers).

This may result because the transcript study definition of "general education" includes courses which the graduates may have chosen as an elective. On the other hand, in the catalogs, education standards include only the requirements in each of the five academic divisions.

General education catalog requirements for elementary and secondary education majors were also examined. In some institutions, the same standards apply regardless of degrees or majors that students pursue. In others, the requirements vary by department or major. Generally, no differences were noted for the general education requirements for secondary education majors relative to arts and sciences majors, since the former usually complete an arts and sciences major. However, for elementary education majors, the general education catalog requirements sometimes differ from those specified for the general bachelor of arts. An average general education requirement for elementary education majors was computed using the campus-wide requirements, plus the differential requirements for elementary education where such were found. This results in a 37 percent average general education component for elementary education majors--similar to the 36 percent average for the bachelor of arts degree.

How do the findings on general education credits earned by teachers compare to those in college catalogs? The elementary teachers completed substantially more lower level general education than the catalogs prescribe. Their lower level general

education component (including the academic courses designated for teachers) comprised approximately 43 percent of total credits earned. For all teachers combined, their lower level general education component comprised 39 percent of the total credits.

How Prescriptive Are the Institutions?

A careful analysis of the catalogs of the 17 institutions reveals that six institutions may be characterized as "prescriptive." They are fairly specific about listing the courses students may take to meet the distribution requirements in each of the five major academic divisions. The list of permitted courses to fulfill the division requirements is not very long.

At the other extreme are eight "free choice" institutions that are not specific about course requirements. Students have wide latitude in choosing a given minimum number of hours across four or five major divisions. If courses are listed that meet the division requirements, the choice may be so wide as to include all courses in a discipline from 100 to 299. Another characteristic of the "free choice" group is that mathematics, foreign languages, philosophy, or various combinations of these disciplines may be interchangeable to meet a divisional requirement. An example of a requirement that exemplifies the "free choice" category is the natural science requirement which reads: "Biology, chemistry, computer science, mathematics, physical science, physics: three one-semester courses; each course must be from a different discipline." This applies in a total baccalaureate program with a minimum of 120 semester hours.

Between these two extremes are three institutions that do circumscribe student choice to some extent, but not as much as the "prescriptive" institutions. For example, one institution does specify the courses that may be taken to meet each of the divisional requirements, but the list is extremely long. The nine quarter-hours in social sciences, for example, in addition to the traditional introductory courses in all the major social

science disciplines, also include environmental problems, family relationships, and criminology. Since these three courses are offered by three different departments, technically and conceivably they would seem to meet the social science requirement.

What do the participating institutions prescribe in terms of coverage within each of the five major academic divisions of general education?

English Requirements. In one respect all 17 institutions are specific on requirements: two English courses with strong writing components are almost always specified in the catalogs. The courses are identified, and must be taken unless the students can "test out" of them. The transcript study findings on English courses with a strong accent on composition produced an average of only 3 hours. The explanation for this fairly low number relative to the catalog requirements is that 60 percent of the graduates had transfer credits, and English is a course almost always taken in the community or other colleges from whence students transfer. The English courses from other institutions (for which no detail on course content was known) may well have included the composition component that would have brought the average hours well above the 3 hours.

The average number of hours graduates completed in lower level English courses (over 10 hours for both groups of graduates) indicates that the minimum catalog requirement in this academic division is being met.

Mathematics Requirements. The institutions vary tremendously in their general education mathematics requirements for the bachelor of arts. In only seven of the 17 institutions is mathematics explicitly required as part of general education for all degrees or majors. Among the seven that do specify mathematics, four institutions specify courses that have clear prerequisites of high school algebra I and II and geometry; for the other three, almost any mathematics course fits the requirement. For these seven institutions, one mathematics course usually suffices to meet the college requirement. In some institutions, mathematics is mentioned only as an option, along with

other disciplines, to meet a divisional requirement. Thus, for a bachelor of arts degree, courses in mathematics, languages, computer sciences, and even history of science may be taken to satisfy the division requirement. (For the bachelor of science degree, however, mathematics is usually specified as a separate divisional requirement.) Three institutions offer a choice between a philosophy or mathematics course; logic may be the specified philosophy course, but this is not always the case.

In the absence of a pervasive requirement in mathematics, it is not surprising that in the transcript study the average number of hours and level of mathematics taken by graduates were so low, and that a substantial proportion of the graduates took no mathematics at all. The requirements in the majority of institutions are loose enough to permit these outcomes.

Science Requirements. There is more prescriptiveness among the 17 institutions on completion of science courses than there is on mathematics: 14 specify that some science courses must be taken, and half of these indicate that one or more course must include a laboratory. Three institutions group science with other disciplines for the purpose of academic division requirements, giving students a choice as to whether they take any science at all. Practically all the graduates in the transcript study completed some science course. The average number of science hours earned is approximately 12 for both groups of graduates (11 of which are lower level courses, on the average). At least half of the hours, on the average, include a laboratory component.

As to which science students shall take, only five institutions specify that the division requirement must include both biological and physical sciences, or at least two different disciplines. Two institutions take the opposite tack: they require that the minimum hours be completed as a sequence in one science. The remaining 10 institutions allow leeway in how students spread those requirements across one or more science disciplines.

The free choice of the requirements for science that were indicated in many of the catalogs is mirrored in the transcript study findings. Over half of the graduates in both groups took no chemistry or physics courses; most students took biological sciences. Graduates completed more credits in the earth sciences than in chemistry and physics.

Social Science Requirements. Almost all of the 17 institutions require completion of some courses within the social science division. However, there is tremendous variance in the specificity of disciplines and credits required within the divisional standard.

Of the 17 institutions, only three require that U. S. history be included as part of the social science divisional requirement. These same three institutions also specify in their catalogs that a course shall be taken in U. S. government. One additional institution specifies that the divisional requirement in history must include a course in western history.

The graduates in the transcript study on the average completed more credits in the social sciences than in any of the other major academic divisions of general education.

The lack of specificity in how social science divisional requirements are to be met may explain the fact that almost half of the teachers and over one-third of the arts and science graduates in the transcript study took no political science course (the discipline in which one would expect U.S. government to be covered). While history of some kind was taken by at least 90 percent of the graduates in both groups, coding did not differentiate between particular history courses taken by the graduates; thus, it is not known what proportion took a course in U.S. history.

Other Liberal Arts Requirements. This category covers general education requirements in those humanities not specified heretofore. For example, requirements in philosophy, music, art, and foreign languages are included here. No attempt was made to check the divisional requirements in the catalogs for each of these disciplines, except for foreign languages. For five of the 17 institutions, foreign language is required

for students pursuing a bachelor of arts. The findings of the transcript study that one-third of the arts and sciences graduates and three-fourths of the teachers took no foreign language tends to corroborate the catalog requirements which show that a preponderance of th institutions do not require such a study for all bachelor of arts degrees.

CHAPTER V

COURSEWORK IN MAJORS

Coursework in the major field of study was examined for arts and sciences graduates and for teachers; graduates were grouped by majors or groups of majors. For the arts and sciences graduates, for example, science majors were grouped either as biological science or physical science majors.

For teachers, the major fields were grouped as (1) secondary academic subjects (e.g., English and mathematics), (2) a subject outside of the arts and sciences other than education (physical education), and (3) a specialty within education (e.g., elementary education). This section includes discussion on majors for teachers in (1) and (2) above; content preparation for elementary and early childhood education majors was discussed in Chapter IV.

Essentially, the teachers included in this chapter include those eligible to teach an academic subject in secondary schools, or fine arts and physical education at all levels. For details on the inclusion of majors for the analysis here, see Appendix F.

Arts and Sciences Graduates

The average total hours completed in a major differ substantially among arts and sciences graduates, as shown in Table 19, column 4. For example, the average total hours in the major for economics and political science majors are only 26 and 34 hours, respectively, while for physical sciences and for fine arts majors the averages are 56 and 64 hours, respectively (see Appendix G for course inclusions).

There is also variation among majors as to the percentage of total credits for graduation earned in the major, from 21 percent to 46 percent for economics and fine arts majors, respectively (see Table 19, column 5). Some of these differences may be accounted for by the coding scheme, which excluded courses outside of the

arts and science disciplines, except if they were education or physical education courses. For instance, no business courses were included in the compilation of hours for the arts and sciences majors. An economics major may have taken a number of hours in the business school, but such hours were not recorded. In addition, the grouping of some majors--fine arts, physical sciences, social sciences--into composite areas produces an inflated number of hours (see Appendix H).

Table 19

HOURS AND PERCENT OF TOTAL CREDIT IN MAJOR

	Teachers			Arts and Sciences		
	Average Hours	Percent of Credit in Major	Percent at Upper Level	Average Hours	Percent of Credit in Major	Percent at Upper Level
Mathematics	33.5	24.1%	44.6%	36.8	27.5%	46.0%
English	38.2	27.8	56.8	43.6	33.8	63.6
Fine Arts	57.9	37.5	42.0	64.5	45.6	48.0
Languages	42.1	31.0	59.9	48.5	36.1	47.6
Sciences	49.4*	34.2	31.3	---	---	---
Biological Sciences	----	----	----	39.3	28.7	62.1
Physical Sciences	----	----	----	55.8	39.4	46.6
Social Sciences	56.6**	40.3	38.5			
History	----	----	----	37.4	29.0	61.1
Political Science	----	----	----	34.5	26.7	72.0
Psychology	----	----	----	38.3	29.4	71.8
Economics	----	----	----	26.4	21.1	67.7
Sociology	----	----	----	36.2	27.6	74.5
Physical Education	51.0	35.1	69.3	---	---	---

* Total hours in biological and physical sciences for science education majors
** Total hours in the social sciences for social science education majors

The ranges of the average hours in the arts and sciences majors indicate considerable variation among institutions. Average total hours in selected arts and sciences majors (disciplines of science, English, mathematics, social sciences, and the languages) range from an average of 37 hours at one institution to 50 hours at another.

Teachers

The average total hours completed in the major for the teachers are shown in Table 19, column 1, and range from 33 hours for mathematics to 58 hours for fine arts. As a proportion of total credits, hours in the major range from 24 to 40 percent in mathematics and social sciences, respectively.

Among institutions, the ranges of the average hours in the academic majors (mathematics, science, English, social studies, and the languages) varied considerably--36 hours to 59 hours, on the average, for the academic disciplines. The percentage that credits in the major represent relative to total credits earned for graduation is shown for teachers in column 2 of Table 19.

Comparison of Arts and Sciences Graduates and Teachers

Course-taking patterns in the major are compared for the two groups of graduates where a comparison is at all possible. While there is a clear parallel between arts and sciences graduates who major in English and teacher graduates who major in English education, the correspondence is somewhat less direct in the comparisons of individual biological science and physical science disciplines for the arts and sciences graduates, and the grouping of disciplines for teacher graduates preparing to teach science.

Results and Analyses of Majors

Mathematics Majors

The arts and sciences graduates took slightly more hours, on the average, in the major field of mathematics than did teachers. The percentage of mathematics courses, when compared to total credit hours, is also higher for the arts and sciences majors: 27 percent for the arts and sciences graduates and 24 percent for the teachers (see Table 20). Collectively, while only around 40 percent of the arts and sciences graduates took as little as 26 percent or less of their total credits in mathematics, almost 70 percent of the teachers were in this lower portion of the range (see Appendix I).

Table 20

HOURS AND PERCENT OF CREDIT IN MAJOR--MATHEMATICS

	Teachers (N = 128)	Arts and Sciences (N = 121)
Average Hours		
Lower Level	18.5	18.1
Upper Level	15.0	18.6
Total	33.5	36.7
Percent of Total Credits in Mathematics	24.1%	27.5%
Percent of Mathematics at Upper Level	44.6%	46.0%

The arts and sciences graduates took an average of 3 hours more than the teachers in upper level mathematics courses, while at the lower level the number of hours was about the same. Fifty percent of the arts and sciences graduates took more than half of their mathematics coursework at the upper level; 38 percent of the teachers had that amount of total upper level courses (see Appendix J). This probably reflects the curriculum for teachers, which concentrates more heavily on courses applicable to teaching areas in high school.

Because computer science courses are taken in many mathematics programs as a part of, or in conjunction with, a mathematics major, the combination of computer science courses and mathematics courses was analyzed. For teachers, the average hours in computer science courses were 2.8, while the arts and sciences graduates averaged 15.0 hours. The differences in course-taking patterns are quite apparent in that only 2 percent of the teachers took as much as 40 percent of their total credit in mathematics/computer science courses, while 49 percent of the arts and sciences majors were within this upper range in course-taking (see Table 21). In light of the introduction of computers into schools, the preparation of mathematics teachers in computer education during their pre-service program appears limited for 1983 graduates.

Table 21

PERCENT OF TOTAL CREDIT IN
MAJOR--MATHEMATICS/COMPUTER SCIENCE

	Teachers		Arts and Sciences	
	Number	Percent	Number	Percent
0	----	----	----	----
1-19%	18	14.1	----	----
20-26%	49	38.3	7	5.8
27-33%	49	38.3	20	16.5
34-39%	9	7.0	34	28.1
40-49%	3	2.3	49	40.5
50%-above	----	----	11	9.1
Total	128		121	

An examination of the courses that teachers of mathematics took indicates that an average of slightly less than 3 hours of "mathematics for teachers" (representing less than 10 percent of the total mathematics credits) was included in total mathematics hours. However, 50 percent of the teachers did not take any courses in mathematics designed primarily for teachers, which are generally directed toward elementary teachers.

Science Majors

For analysis, the arts and sciences graduates are grouped by biological sciences and physical sciences (see Appendix F). For the teachers, all of those with majors in science education are grouped together.

The physical science majors, on the average, took the most total hours in comparison to the other two groups: biological science majors averaged 39 hours; science education, 49 hours; and physical science, 56 hours. However, these differences in average total hours reflect not only differences in course-taking patterns, but in how the majors are grouped for this analysis. Since all physical science majors are grouped together, and all science education majors are grouped together, for each of these two groups all courses relating to the included majors are counted. For example, for

the physical science group, courses in chemistry, physics, and the earth-space sciences would be counted; for the science education group, courses in any natural science would be counted. Yet for the biological science group, only biological science courses were counted.

Future science teachers took 34 percent of their total credits in the major, while biological science majors averaged 29 percent and physical science majors averaged 39 percent in the major relative to total credits (see Table 22). The teachers took more coursework in sciences than the average biology major did in biology, but about one course less than the average physical science major took in all physical sciences combined. A larger proportion of biological science majors (37 percent) and teachers (28 percent) took as little as 26 percent of their total credits in their majors compared with only 5 percent of the physical sciences majors (see Appendix I).

Table 22

HOURS AND PERCENT OF CREDIT IN MAJOR--SCIENCE

	Teachers	Arts and Sciences	
	Science Education (N = 115)	Biological Sciences (N = 367)	Physical Sciences (N = 310)
Average Hours			
Lower Level	33.1	14.7	29.3
Upper Level	16.2	24.6	26.5
Total*	49.3	39.3	55.8
Percent of at Upper Level	31.3%	62.1%	46.6%
Percent of Total Credit in Major*	34.2%	28.7%	39.4%

* Total credit in major for science education majors includes all credit taken in the biological sciences, physical sciences, and other physical and earth sciences

Total credit in major for arts and sciences graduates includes the biological sciences for majors in biological science, and chemistry, physics, and other physical and earth sciences for physical science majors

Differences in course-taking patterns are evident from the number and percent of upper level hours taken by the groups. Biological science and physical science graduates averaged 25 and 26 hours at the upper level, respectively, while teachers averaged 16 hours. The teachers took more hours at the lower level (33 hours) when compared with 29 for the physical sciences and 15 for the biological sciences (see Table 22). The caution regarding the inclusion of more disciplines in analyzing science education and physical science majors than for biological science majors is particularly applicable to the lower level courses.

Less than 10 percent of the teachers took at least half of the major courses at the upper level, while 84 percent of the biological science and 50 percent of the physical science majors did so (see Appendix J).

The curriculum patterns for the teacher education graduates are examined in more detail by compiling information on the inclusion of laboratory courses, courses designed for liberal arts students, and the breadth of the coverage for the teachers (see Table 23).

Table 23

AVERAGE TOTAL HOURS BY DISCIPLINES AND
PERCENT OF TOTAL SCIENCE HOURS TAKEN BY TEACHERS

	Average Hours	Percent of Total Science Hours
Biological Sciences	27.3	55.2%
Chemistry/Physics	15.8	30.6
Other Sciences (Earth/Space)	6.1	13.8
Science for Teachers	.5	1.0
Science for Liberal Arts Majors	2.4	5.9
Science with Lab	35.4	---
Science Methods	2.0	---

The teachers took an average of 35 hours (71 percent of their total credit in sciences) in courses with a substantial laboratory component. The teachers took very few hours, on the average, in science courses designed for liberal arts students (2.4 hours). Fifty-eight percent of the teachers took no science course designed for liberal arts students; only 7 percent took over 20 percent of their science hours in courses designed for liberal arts majors (see Table 24).

Table 24

PERCENT OF TOTAL SCIENCE CREDIT TAKEN BY TEACHERS IN COURSES DESIGNED FOR LIBERAL ARTS MAJORS

	Number	Percent
0	67	58.2%
1-9%	19	16.5
10-19%	21	18.3
20-above	8	6.9
Total	115	

An examination of the average number of hours taken in each discipline area indicates that, on the average, the teachers are better prepared in the biological sciences than the other scientific fields (see Table 23). Of the 115 science education majors, only 11 percent took less than 30 percent of their total science courses in the biological sciences. On the other hand, almost half of the teachers' group took less than 30 percent of their science courses in the areas of chemistry and physics combined. A very large proportion (86 percent) of the graduates took less than 30 percent of their science courses in the earth and space sciences. Almost 10 percent of the future science teachers took no chemistry or physics courses and 28 percent took no earth science/space science courses (see Table 25). An average of only 1 percent of the total hours of science taken were in courses designed as "science for teachers."

Table 25

PERCENT OF SCIENCE CREDITS
IN VARIOUS DISCIPLINES--TEACHERS

Percent of Total Science Credit	Biology		Chemistry/ Physics		Physical and Earth Sciences	
	Number	Percent	Number	Percent	Number	Percent
0	3	2.6%	11	9.6%	33	28.7%
1-9%	2	1.7	---	---	27	23.5
10-19%	4	3.4	18	15.6	25	21.7
20-29%	4	3.4	26	22.6	15	13.0
30-49%	29	25.2	45	39.1	8	6.9
50-64%	38	33.0	10	8.7	5	4.3
65%-above	35	30.4	5	4.3	2	1.7
Total	115		115		115	

Although an exact count was not made of the number of graduates in science education who were specifically certified to teach the biological versus the physical sciences, other information indicates that the majority were prepared and certified to teach biology. The findings substantiate the claims that prospective science teachers in general are better prepared in the biological sciences than in the physical or earth sciences, and that the supply of science teachers in the biological sciences is greater than those prepared for the physical sciences.

In general, the science teachers took substantial science hours. About two-thirds of the major is concentrated in the lower level courses, possibly indicating that courses are taken in the several sciences at the lower levels. However, it is quite evident that in-depth specialization in the physical or earth sciences was taken by very few prospective science teachers. Most of the courses teachers took were regular science courses, with very few designed for liberal arts students or for teachers only. Science methods courses for those teachers who prepared for the secondary classroom were at a minimum.

English Majors

Arts and sciences English majors took an average of 5 total hours more in English than prospective teachers of English. This difference represents coursework taken primarily at the upper level; arts and sciences majors took almost 6 hours more in upper level English, on the average, than prospective teachers. The teachers took about 28 percent of their total credits in English, as compared with 34 percent for arts and sciences graduates (see Table 26).

Table 26

HOURS AND PERCENT OF CREDIT IN MAJOR--ENGLISH

	Teachers (N = 150)	Arts and Sciences (N = 163)
Average Hours		
Lower Level	16.5	15.9
Upper Level	21.7	27.7
Total	38.2	43.6
Percent of Total Credits in English	27.8%	33.8%
Percent of English at Upper Level	56.8%	63.6%

Very few of the teachers (10 percent) took more than one-third of their total hours for graduation in English, while more than half of the arts and sciences graduates did (see Appendix I). Most (89 percent) arts and sciences graduates took more than half of their coursework at the upper level, as compared with three-fourths of the teachers who took that proportion of their major coursework at the upper level (see Appendix J).

Social Science Majors

The arts and sciences majors in the social sciences are analyzed by specific majors: history, political science, psychology, economics, and sociology. The following average total credit hours were earned:

	Average Hours	Average Percent of Total Credits
History	37.4	29.0%
Political Science	34.5	26.7
Psychology	38.3	29.4
Economics	26.4	21.1
Sociology	36.2	27.6

The abnormally low total hours in economics can probably be explained by the fact that economics courses in the College of Business were not coded for the study (only those offered in the Colleges of Arts and Sciences were coded). Presumably, a number of economics courses or corollaries might have been taken by economics majors outside the arts and sciences department. With the exception of economics, the major hours claim slightly over one-fourth of the total hours for the social science majors (see Table 27). Lower level course hours range, on the average, from slightly over 8 for economics to 14 for history. Most of the work in these majors was taken at the upper level, with a range from 61 percent for history majors to 74 percent for sociology majors.

Eighteen percent of the history majors took as much as over one-third of their total credits in their major; approximately 14 percent of the political science majors, 27 percent of the psychology majors, and 21 percent of the sociology majors did the same (see Appendix I). The proportion of students taking more than one-half of their major credits at the upper level is very high: 84 percent for history, 95 percent for political science, 90 percent for psychology, 98 percent for economics, and 93 percent for sociology (see Appendix J). The extraordinarily high percentage for economics could be because the lower level courses taken outside the arts and sciences department were not coded.

Table 27

HOURS AND PERCENT OF CREDIT IN MAJOR--SOCIAL SCIENCES

	Teachers	Arts and Sciences				
	Social Sciences (N = 258)	History (N = 133)	Political Science (N = 260)	Psychology (N = 439)	Economics (N = 71)	Sociology (N = 115)
Average Hours						
Lower Level	34.7	14.5	9.4	10.4	8.1	8.6
Upper Level	21.9	22.9	25.1	27.9	18.3	27.6
Total	56.6	37.4	34.5	38.3	26.4	36.2
Percent Total Credit in Social Sciences	40.3%	29.0%	26.7%	29.4%	21.1%	27.6%
Percent Social Sciences at Upper Level	38.5%	61.0%	72.0%	71.8%	67.7%	74.5%

For the teachers, all graduates with a major in the social sciences who were eligible for certification were included. The total number of credits for these teachers reflect the total number of hours in all social science areas, as was the case with the science teachers.

On the average, the teachers accumulated 57 hours in the social sciences. This represents 40 percent of their total credits (see Table 27). The teachers took an average of 35 lower level hours; an average of 22 hours were at the upper level. Ninety-one percent of the teachers took over one-third of their total credit in their majors (see Appendix I).The proportion of teachers taking more than one-half of their total hours at the upper level is 24 percent (see Appendix J).

A comparison of the teachers with the arts and sciences graduates should be made with caution because of the grouping of social sciences in a composite field for the teachers, while the courses taken by arts and sciences graduates were considered by major discipline. In general, the social science teachers took substantially more courses at the lower level in the composite major than the arts and sciences majors took at the lower level in one discipline.

To determine the breadth of coverage for the social sciences teachers, the credits for the various disciplines within the social sciences were examined (see Table 28).

Table 28

AVERAGE TOTAL HOURS BY DISCIPLINES
AND PERCENT OF TOTAL SOCIAL SCIENCE HOURS
TAKEN BY TEACHERS

Disciplines	Average Hours	Percent of Total Social Sciences Hours
History	21.9	39.6%
Political Science	9.0	15.9
Psychology	8.0	15.0
Sociology	5.8	9.8
Economics	4.0	6.8
Other Social Sciences*	7.7	12.8

*anthropology, geography, and others

The number and percent of teachers taking less than 20 percent of their total credit in each of the disciplines (history, political science, psychology, economics, and other social sciences) serve as indicators of the breadth of coverage. On the average, 16 percent of the teachers took less than 20 percent of their social science credits in history; 78 percent took less than 20 percent in political science; 82 percent took less than 20 percent in psychology; 97 percent of the teachers took less than 20 percent in economics; and 46 percent took less than 20 percent in the other social sciences (including sociology) (see Table 29). Three-fourths of the teachers take at least 30 percent of their social science credits in history.

The limited coverage in sociology and economics is explained by the fact that very few teachers are certified in these subjects, and that these fields are often not included in the high school curriculum. However, the fact that teachers take only an average of 8 hours in political science and over three-fourths of the teachers take

Table 29

PERCENT OF SOCIAL SCIENCE CREDITS IN VARIOUS DISCIPLINES--TEACHERS

Percent of Total Social Sciences Credits	History (N = 258)		Political Science (N = 258)		Psychology (N = 258)		Economics (N = 258)		Other Social Sciences* (N = 258)	
	N	%	N	%	N	%	N	%	N	%
0	2	.8	16	6.2	34	13.2	79	30.6	26	10.1
1-9%	6	2.3	51	19.8	99	38.3	86	33.0	41	15.9
10-19%	34	13.2	134	51.9	79	30.6	85	32.9	51	19.8
20-29%	27	10.5	30	11.6	15	5.8	5	1.9	67	25.9
30-49%	119	46.1	20	7.7	11	4.3	3	1.2	54	21.0
50-64%	41	15.9	6	2.3	5	1.9	---	---	14	5.4
65%-above	29	11.2	1	.4	15	5.8	---	---	5	1.9

* Includes sociology, anthropology, geography

less than 20 percent of their composite social science credits in political science should be examined in light of the number of courses related to political science which are taught at the secondary level. These numbers are averages and probably reflect the number of teachers majoring in one discipline or another as opposed to a program that any one teacher takes.

Language Majors

Teachers who majored in language education or majored in a language and obtained certification to be a secondary language teacher completed, on the average, about 6 hours fewer total credits in the major than the arts and sciences languages majors (see Table 30). On the average, the teachers tended to take fewer lower level hours (18 hours compared to 26 hours for arts and sciences majors), but had a slightly larger number of upper level courses.

Table 30

HOURS AND PERCENT OF CREDIT IN MAJOR-- LANGUAGES

	Teachers (N = 32)	Arts and Sciences (N = 89)
Average Hours		
Lower Level	17.9	25.7
Upper Level	24.2	22.8
Total	42.1	48.5
Percent of Total Credits in Language	31.0%	36.1%
Percent of Language at Upper Level	60.0%	47.6%

Thirty-four percent of the arts and sciences majors took at least 40 percent of their total hours in a language; only 12 percent of the teachers concentrated that degree of total credits in a language (see Appendix I). Three-fourths of the teachers took over half of their language credits at the upper level; while only 50 percent of the arts and sciences graduates completed at least half of their language hours at the upper level (see Appendix J). The small numbers should also be taken into account when examining these data.

Fine Arts Majors

The fine arts category includes art, music, and drama courses, rather than a specific major. Therefore, the total credits for arts and sciences graduates and teachers represent the composite field of fine arts. The teachers took approximately 7 fewer hours, on the average, in fine arts than arts and sciences graduates. The differences appear in the upper level courses, with the arts and sciences majors taking an average of 5 hours more than the teachers. At the lower level, teachers took about one hour less than

the arts and sciences graduates (see Table 31). The arts and sciences graduates completed a greater proportion of total credit in fine arts (46 percent) than teachers did (37 percent).

Table 31

HOURS AND PERCENT OF CREDIT IN MAJOR--FINE ARTS

	Teachers (N = 415)	Arts and Sciences (N = 405)
Average Hours		
Lower Level	33.2	34.3
Upper Level	24.7	30.2
Total	57.9	64.5
Percent of Total Credits in Fine Arts	37.5%	45.6%
Percent of Fine Arts at Upper Level	42.0%	48.0%

Almost 40 percent of all arts and sciences majors took over half of their total college credits in the fine arts, while only 9 percent of the teachers took over half of their college credit in the fine arts (see Appendix I). Fine arts departments offer courses designed primarily for teachers, and the teachers took an average of 5.0 hours in these courses. The data in this section do not include fine arts courses that are offered within the College of Education in some institutions.

Physical Education Majors

The physical education teachers took 51 hours in their major. While the number of hours is large, the percentage of the total credit hours (35 percent) is not as high as for some other majors, indicating that most physical education students took a large number of total credit hours.

Almost 70 percent of the total hours in the major of physical education were taken at the upper level (an average of 35 hours) plus 16 hours at the lower level (see Table 32). These amounts do not include the transferred credits in physical education and education courses combined (see page 65).

Table 32

HOURS AND PERCENT OF CREDIT IN MAJOR--PHYSICAL EDUCATION

	Number = 367
Average Hours	
Lower Level	15.7
Upper Level	35.0
Total	50.7
Percent of Total Credits in Physical Education	35.1%
Percent of Physical Education at Upper Level	69.3%

CHAPTER VI

EDUCATION COURSEWORK

This chapter examines the education courses taken by the teachers. Summary data are presented for teachers as a whole; however, because of considerable differences among teachers preparing for a variety of assignments, the more important data pertain to subgroups of the teacher population.

For the purpose of analyzing the teachers' education courses,* the following certification areas were analyzed (see Appendix K for details).

	Number
Secondary Academic Areas	716
Elementary and Early Childhood	1,251
Special Education	524
Fine Arts	404
Physical Education	355

The average number of hours of education credits is slightly understated because it does not include some transferred education courses. It is estimated that, on the average, the transferred education credits would raise total education credits by approximately one hour.**

For all teachers, the average number of course credits taken in education at the 4-year institution was 42, of which 39 hours were earned at the upper level. Since most students are not admitted to Colleges of Education until the end of their sophomore

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* See Chapter II for specifics on how education courses are classified.

** In coding transferred credits, no distinction was made between physical education and education courses. Arts and sciences graduates who transferred credits earned an average of 3.4 hours in physical education. (It is assumed that these graduates would not have taken any education courses.) For elementary teachers, an average of 7.3 hours was transferred in the combined areas for the 42 percent who transferred credits. Assuming that they also took an average of 3.4 hours in physical education before graduating, this leaves an average of 3.9 hours in education credits. Since 42 percent of all elementary teachers transferred credits, this 3.9 hours translates into an average of 1.5 hours for all elementary teachers. Secondary teachers transfer, on the average, .9 hours in education credits.

year, it is to be expected that most of their education course credits would be at the upper level. The education hours taken by all teachers, on the average, represent 30 percent of the total 142 credits. In addition to the average of 42 hours in education, the teachers also took an average of 4 hours in academic courses designated primarily for teachers (see Table 33 and Appendices L and M).

Secondary Teachers--Academic Subjects

The average total credit hours in education courses taken by those preparing to teach academic subjects (mathematics, science, English, social studies, languages) in secondary schools were 28 hours. This average of 20 percent of total credit is considerably less than that for the other four subgroups of teachers. Ninety-five percent of the education credits were at the upper level; 42 percent represent courses with field experiences (an average of 8.9 hours of student teaching plus 2.8 hours of courses with practicums). All courses with any field component were designated as practicums. Approximately one-fourth of the courses these teachers took in the Colleges of Education represent "methods" courses. Thus, the combination of "methods" and field experience courses represents at least two-thirds of the coursework these teachers took in education. In addition to these courses, graduates also earned an average of approximately one credit hour in academic courses designated primarily for teachers, mostly in courses offered by mathematics departments (see Table 33).

Elementary and Early Childhood Teachers

Elementary and early childhood education majors took an average of 49 hours in education courses, with 90 percent (44 hours) at the upper level. These education hours comprise, on the average, 36 percent of the total college credits taken by these majors (see Table 33).

TABLE 33

AVERAGE HOURS IN EDUCATION* AND PERCENT OF TOTAL CREDIT BY EDUCATION MAJOR

	All Teachers (N = 3,283)	Secondary (N = 716)	Elementary (N = 1,251)	Special Education (N = 524)	Drama, Art and Music (N = 404)	Physical Education and Health (N = 355)
Average Education Hours						
Lower Level	3.3	1.3	5.0	4.6	2.1	.9
Upper Level	39.1	27.0	44.4	64.7	24.1	22.1
Total	42.4	28.3	49.4	69.3	26.3	23.0
As Percent of Total Credit Hours	30.1%	20.2%	36.2%	47.9%	17.4%	15.8%
Average Hours of Academic Courses for Teachers						
Total	4.4	1.0	7.5	3.5	5.6	.5
As Percent of Total Credit Hours	3.2%	.7%	5.6%	2.4%	3.6%	.4%
Average Total Field Hours	15.4	11.8	16.4	23.7	11.5	11.2
Lower Level Practicum	.8	.4	1.0	1.5	.3	.2
Total Practicum	5.3	2.8	6.5	11.4	1.7	1.7
Total Student Teaching	10.0	8.9	9.9	12.3	9.8	9.5
Average Hours of Methods Courses						
Total	13.0	7.5	18.8	17.2	6.1	3.5
As Percent of Total Education Hours	28.4%	26.3%	37.5%	24.8%	19.4%	15.0%
Average Hours of Academic Courses for Teachers and Methods Courses						
As Percent of Total Credit Hours	12.4%	6.0%	19.3%	14.1%	7.7%	2.8%

* Does not include education credits transferred from other institutions

In addition, these teachers took an average of 7 hours in academic courses designed primarily for teachers; elementary teachers took these courses to a greater degree than any other subgroup. For example, almost all institutions include two semesters of mathematics designed for teachers in their curriculum.

The total field hours (student teaching plus practicum courses) averaged 16 hours for elementary teachers, with an average of one hour at the lower level. Student teaching courses averaged almost 10 hours.

Elementary teachers take more "methods" courses than any of the other groups of teachers; the average was almost 19 hours, compared to 7.5 hours for secondary academic teachers. Special education teachers also take a substantial number of credits in "methods." For the elementary teachers, these "methods" make up about 37 percent of their total education hours. Over three-fourths of the elementary teachers (76.7 percent) take at least 30 percent of their education hours in "methods" courses (see Appendix N). When academic courses designed primarily for teachers and methods courses are combined, they total an average of 26.3 hours, or 19.3 percent of the total credits taken at the institution.

Approximately 42 percent of the total credits accumulated by elementary or early education teachers were either in courses taught in the department of education or in academic courses specifically designed primarily for teachers. This compares with an equivalent total for secondary academic teachers of 21 percent (see Table 33).

K-12 Teachers of Fine Arts and Physical/Health Education

The two specialty areas--fine arts (art, music, drama) and physical education/health education have similar accumulations of education hours. An average total of 26.3 education hours and 23.0 education hours, respectively, make up 17 and 16 percent of the total credits taken. Both fine arts and physical/health education teachers accumulate fewer hours in the department of education than the other subgroups.

It should be noted that for teachers in both areas a substantial number of additional courses are taught within the departments (fine arts or physical/health education) that apply to the techniques of teaching, such as methods in teaching physical education or the arts. The fine arts teachers took an average of 6 hours of courses designed primarily for teachers in the fine arts department.

Both groups took an average of 11 hours in field work, most of this represented by student teaching (9.8 and 9.5 hours). The "methods" courses taken in the Colleges of Education make up a smaller proportion of the total education hours taken by these teachers. Fine arts teachers averaged 6.1 hours (19 percent of their total education hours) and physical education graduates averaged 3.5 hours (15 percent of their total education hours) (see Table 33). However, as noted earlier, majors in physical education and in the arts took additional "methods" courses not included in the preceeding statistics.

Special Education Teachers

Special education teachers, on the average, took more hours in the Colleges of Education than any other group of teachers. They averaged 69 hours in education, which is almost half of their total college credit hours (47.9 percent). Approximately 93 percent of these hours were taken at the upper level. They took an average of 3 hours of academic credit in courses designated primarily for teachers.

The special education teachers took substantially more hours of field work in courses that include practicums and in student teaching than other teaching groups did. Their average student teaching hours (12.3) exceed the mean for the other groups of teachers. A total of 17.2 hours on the average was taken in "methods" courses, representing less than one-fourth of the total credit hours in education (24.8 percent).

Summary

Programs to prepare teachers differ greatly, depending on the specialty area of the teacher. Elementary/early childhood teachers and special education teachers average a greater number of education hours (49 and 69, respectively) than was the case for the other specialties. A larger proportion of the elementary and special education teachers' total credits were devoted to education courses offered in the Colleges of Education (36 and 48 percent) than is the case for other teachers. The secondary teachers of academic subjects took only 20 percent of their total credits in education; fine arts teachers took 17 percent. These differences reflect greater emphasis on "methods" courses for elementary and special education students relative to the other teachers.

When academic credits for courses designed primarily for teachers are added to education credits, the totals average 57 and 73 hours for elementary and special education teachers respectively. These average credit hours translate into 42 percent and 51 percent, respectively, of total credits earned by the two groups of teachers. Table 34 describes the average configuration of the total of the education courses plus the courses designed for teachers.

Table 34

DISTRIBUTION OF EDUCATION HOURS AND ACADEMIC COURSES FOR TEACHERS BY TYPES OF COURSES

	Total Hours	"Methods" Courses	Field Work	Other Education Courses	Academic Courses for Teachers
Elementary/ Early Childhood	56.9	33%	29%	25%	13%
Special Education	72.8	24%	33%	39%	5%
Secondary Academic	29.3	26%	40%	31%	3%

When the average of 6.0 hours earned in "PE" at the participating institutions, plus an average of 3.0 hours in transferred credits for physical education/education courses, are added to the data shown in Table 34, elementary teachers earn 66 hours in education, physical education, and academic courses designated primarily for teachers. This represents almost half of their total credits.

The special education and elementary teachers averaged one hour of practicum or field experience at the lower level. Even less exposure to field experience at the lower level was found for the other groups of teachers. The hours of student teaching were similar in most specialties (9 to 10 hours), except for special education teachers, whose average was 12 hours.

Total hours for secondary academic areas as well as elementary/early childhood indicate that institutional differences are great for this selected population. Average total hours in education for elementary teachers ranged from 33 hours at one institution to 65 hours at another. The percents of total credit for the education hours earned by elementary teachers ranged, on the average, from 25 percent at one institution to 46 percent at another.

Total average hours for secondary teachers ranged from 16 hours at one institution to 39 hours at another. The percent of total credit that secondary teachers accumulated in education hours ranged from 12 percent at one institution to 27 percent at another.

Because of the great institutional differences, the data may not reflect programs at any particular institution and must be regarded as averages of all students in the selected population.

Certification Requirements and Education Courses

How do the education credits teachers earn compare to specified requirements for education courses in state certification regulations? State regulations on education courses were analyzed for three types of teacher certificates: elementary, secondary science,

and secondary English. The average requirement for the 14 Southern states is 30 hours for elementary teachers, and 22 hours for secondary teachers. These hours include student teaching. The average credits that the teachers in this study accumulated in education courses (defining education to exclude academic courses designed primarily for teachers) exceed state certification rules. Thus, on the average, the teachers took substantially more courses in education than states require. The credits for elementary teachers exceed the minimum by 65 percent; for secondary teachers by 27 percent.

Catalog Requirements and Education Courses

Earned education credits were also compared to those described in college catalogs as required. Here the correspondence is closer than with the state certification regulations. On the average, according to the catalogs of the 17 institutions, 44.5 hours are required in education courses for elementary teachers, 26.5 for secondary science, and 29 for secondary English teachers. (These requirements also exclude academic courses for teachers, as well as educational psychology in those institutions where it is offered in the psychology department.) The average number of corresponding education credits earned by the transcript study elementary teachers exceeds the catalog statements by approximately 5 hours; however, for secondary teachers the average of 28 credit hours mirrors the catalog requirements for secondary science and English teachers.

CHAPTER VII

BEYOND THE NUMBERS

Statistics alone do not convey the full flavor of the problems associated with the baccalaureate programs--in the arts and sciences as well as in education--completed by some of the graduates in the transcript study. They fail to convey instances when students repeat courses, sometimes more than once, and finally obtain course credit with a grade that is still no higher than a "D." Nor do statistics convey the difficulty some college students encounter in general education courses, but who then earn higher grades in their education courses. Some courses that students take appear to be testaments to their ingenuity in "shopping around." This chapter presents examples illustrative of these and other problems which were uncovered in the transcript study.

Difficulties in Passing Mathematics

> Ann, an arts and sciences major in psychology, made an "F" twice in a junior college course labeled "college mathematics." She took "Introduction to College Mathematics" at the senior institution and earned a "B." No additional mathematics were taken.
>
> Joe, a political science major, took developmental Mathematics II in junior college and earned a "D." He then took "Intermediate Algebra" at the junior college and again made a "D." The junior college catalog's description of the latter course reads: "For those students who find college algebra too difficult." No other mathematics course was taken at the senior institution.
>
> Bill, an elementary education major, took a course called "real number system" at the junior college and failed the course. He took the "real number system" at the senior institution and received a "B." He then took "Mathematics for Elementary Teachers" twice--earning a "D" the first time and a "B" the second time around. No other mathematics course was taken.

Instances of students taking the required mathematics at a different college after repeated failures were noted on a number of transcripts.

> Tony, a political science major, took college algebra three times at a junior college. He made a "D" the first time, and failed the last two times. Then he took "mathematics analysis" at a small private 4-year institution and received a "C" before transferring to the senior institution.

Edward, an elementary education major, took "Basic College Mathematics" at a junior college and received an "A." He then took "Elementary Mathematics for Teachers" at the senior institution twice, failing it both times. He returned to the junior college the summer before graduation and took "Mathematics 101" and received an "A." He took a mathematics methods course for elementary teachers and received a "C."

Academic Problems for Art and Music Education Majors

A large sampling of music and art education majors had great difficulty in passing academic courses outside of their major. Their grades in music, art, or education courses were much higher than in the required academic courses.

Judy, an art education major, was put on academic probation for five quarters and academic suspension for two quarters, yet graduated with a 2.09 G.P.A. During the last two years in college, she earned "A" in six courses (five in education and one art course), three "D's," six "C's," three "B's" (two of the "B's" were in junior college summer courses). Judy received special permission to break senior residence and attend junior college for three courses during her senior year.

Teresa, a music education major, transferred over 50 hours to the senior institution. Of the hours taken, music courses had earned "A's," while all other courses had earned "C's," "D's," and "F's," or withdrawals. In the first two years at the senior institution, she either failed or withdrew from all non-music courses. She earned "A's" and "B's" in education and music education courses. Her science background consisted of two courses in introductory astronomy, the first course was repeated three times before a passing grade was earned. Her only mathematics course was "College Arithmetic," taken at a different institution.

Mike, eligible for certification as a music teacher, did not fare well in courses outside music performance and education. Music theory and history courses repeatedly earned "D's," "F's," and withdrawals. He took music history courses a total of seven times, receiving five "F's," one "D," and a "withdrew failing." He took one mathematics course at the senior intitution, "Math Insights," and received an "F." He took basic mathematics at a junior college and received a "C." He attempted an English composition course six times, receiving two "F's," one "D," one "C," one "incomplete F," and one "incomplete." He received another "incomplete F" in an upper level English course. He took 10 education or music education courses, receiving one "A," seven "B's," one "C," and one "passing" grade.

Illustrative Inconsistencies

Some students "shop around for courses" after repeated failures. Others seem to be late starters. Some who become teachers do very poorly in content courses, but raise their grade point average through the education courses.

John started college as a liberal arts major and six years later graduated with eligibility to be an elementary teacher. After five semesters, his grade point average was 1.3. He withdrew from the university and returned a year-and-a-half later. After one semester of general education courses in which he earned "A's" and "B's," he entered the College of Education and earned over a 3.0 average for the remaining courses.

Erica, a university student majoring in social science, earned credit for the same course more than once. She took first-year Spanish and received an "incomplete" in spring of 1978. She took it again in winter of 1980 and received five hours credit with a grade of "C." In spring of 1980 she took Spanish II and withdrew. In fall 1981 she audited Spanish I and in spring of 1982 took Spanish I again and received a "C" and five hours credit. She subsequently took Spanish II and III and received 10 hours additional credit.

Drew, a mathematics education major, received grades of "D," "F," and "W" in 30 percent of the courses he attempted in mathematics, while earning an "A" or "B" in 35 percent of the courses. (The higher grades were earned in the lower level courses.) For a sequence of 16 education courses, he received a "D," "F," or "W" six percent of the time and "A," "B," or "Pass" 76 percent of the time.

Beverly, a science education major, took only one mathematics course, "College Algebra." She attempted 44 courses in the sciences and received 22 "D's," "F's," or withdrawals. She attempted the first quarter of organic chemistry twice, the second quarter three times before passing; she took the third quarter three times, failing each time. She attempted "Introduction to Physics" four times, finally passing with a "C" her last semester. This student graduated "with honors."

The Smorgasbord of College Courses

The process of coding more than 6,000 transcripts produced signals that the general education component for many students (arts and sciences and education majors) leaves something to be desired. Some courses on the transcripts stirred one's curiosity. For example, given the general disinterest in physics among arts and sciences and teacher graduates, why in one institution were students earning credits in physics courses? Upon inspection, it turned out to be a course on "Acoustics of Musical Instruments." In another institution, an unusually large number of teachers demonstrated an interest in a course offered in the Aviation Management Department, "Meterology," which focuses on the effects and phenomena of weather. Do such courses represent the desired

foundation in science to fulfill general education requirements? Astromony is a frequent choice at those institutions whose distribution requirements are not tightly prescribed. While astronomy can be a rigorous course, when it is taken instead of physics and chemistry, a cynic might explain its popularity on the basis of the opportunities it provides students for star gazing. At one institution many students completed a 400-level biology course. This turns out to be the course: "Man and His Environment: The interaction of man and the environment, emphasizing the intimate relationship of the biosphere to man. Not available for biology major credit." An important, and possibly rigorous course, but does it represent a foundation in science for the purpose of meeting general education division requirements?

The interest among teachers in anthropology courses produces the following frequently chosen offerings: "Southern Appalachian Folk Culture" in one institution, and "Understanding Other Cultures" in another. The former course is offered by a university located in the Appalachians, so that students would be expected to have some prior knowledge of the culture. The interest in other cultures complements the need for teachers to understand the different backgrounds of pupils they will teach. Yet, one wonders whether these topics are more important than American government, or principles of economics--social science courses taken less frequently by teachers.

English courses could not be ranked by levels of content, as was possible for mathematics courses. Yet, some transcripts signal that there may be problems in this academic division of general education, just as was found for mathematics. While the high school curriculum in the last three years has been tightened so that drama and film-making no longer count as English credits, the transcripts of some college students indicate that for them film-making satisfies a part of the English division requirements.

The fluff that is represented by some courses education majors take is illustrated by an art education course, offered at the upper level with three semester credits, that appeared quite often on teacher transcripts in one institution: "Lettering, Posters, and Displays in the School Program."

CHAPTER VIII

INTERPRETATION AND CONCLUSIONS

General Education: All Students

The process of coding an average of over 40 courses for more than 6,000 transcripts of college graduates from 17 major institutions warrants some interpretation and evaluation of the level of today's baccalaureate. There are differences, of course, among institutions in the findings. This analysis of averages fails to show stronger programs and course-taking patterns in some universities, and weaker ones, relative to the averages, in others.

On the surface, students are meeting the general education requirements across the major distribution standards established by their institution. They devote approximately 45 percent of the total baccalaureate to what might be called "general education." Problems arise from the way some students meet the distribution requirements across the divisions--giving short shrift to important disciplines by taking courses that appear to satisfy the "letter of the law," but scarcely the content that educators envision as a liberal arts component for all students.

The dearth in quality and quantity of coursework in mathematics is amazing. Mathematics is the only discipline that lends itself to a ranking of courses by levels of difficulty on the basis of stated prerequisites. Less than a third of the graduates took only college-level mathematics courses. Another 11 percent took either no mathematics at all, or only a remedial course at the participating institution.

Even universities (as compared to community colleges or other four-year institutions) grant college credit for remedial English, although this does not happen as frequently as for mathematics. If what was found for mathematics is indicative of the level of work in other general education disciplines, the core curriculum for a large proportion of students is more akin to a high school program than higher education.

Given latitude, some students will ferret out the routes of least resistance to meet their general education requirements, and then pass the word on to others. This natural reaction to choice is evident when students take courses about the weather, the environment, or the acoustics of musical instruments to meet their science requirements, or Appalachian folk lore to fulfill social science minimums. Given freedom to choose, many students gravitate toward courses that deal with what is already familiar, rather than testing cold and unknown territory. These choices hardly produce a broadening experience, which the general education component is supposed to represent.

This study was undertaken primarily to assess the preparation of teachers. The arts and sciences graduates were included to provide a point of reference for the analysis of the teachers' preparation. The interpretation of the findings focuses more on the teachers because of the purpose of this study. However, while arts and sciences graduates complete a more rigorous general education component than is true for teachers as a whole, this does not indicate that the core curriculum for the arts and sciences students is in great shape.

For example, the arts and sciences graduates earned an average of 12 hours in English, thus allowing for approximately two courses in addition to the normal two required to fulfill freshman English requirements. Does this offer students sufficient exposure to literature and writing? When, after excluding English majors, only one-quarter of the arts and sciences graduates takes an upper level English course, what likelihood is there that college graduates have delved deeply into reading and writing?

When the humanities are aggregated to include English, history, foreign languages, philosophy, art and music appreciation and history, classics, and religion, do 34 credit hours (25 percent of the total curriculum) represent sufficient exposure?

While arts and sciences graduates do complete slightly more hours in mathematics than teachers, their record too leaves something to be desired. Forty-four percent

limited their math-taking to college-level courses, but 11 percent took no mathematics at all. Over half took no chemistry and/or physics, even when survey courses designed for non-major liberal arts students are included. Again--students choose the line of least resistance, gravitating to subjects with which they are familiar (such as biology, from their high school experience), rather than tackling something new and presumably harder. Is shying away from challenges the preparation that college provides for the later stages in life?

General Education: Teachers

When all teachers are considered together, they earned fewer general education credits than the arts and sciences graduates and a smaller proportion of the teachers' credits were upper level courses. There is one exception to the above finding: the teachers took more social science hours than the arts and sciences graduates, due to the psychology courses the former complete. In all the other social science disciplines, however, the teachers took fewer credits. Even in the social sciences as a whole, in which teachers have more total hours than the arts and sciences graduates, again, the teachers are at a disadvantage in that they take a lower proportion of upper level courses. Teachers, as compared to arts and sciences graduates, take fewer hours in mathematics, English, physics, chemistry, economics, history, political science, sociology, other social sciences, foreign languages, philosophy, and other humanities. The teachers take more hours than the arts and sciences graduates in biology, geology, and other physical sciences, and fine arts.

There are considerable differences in the general education of teachers preparing for different levels of certification. Those preparing for elementary teaching take more general education courses than other teachers (secondary, special education, art and music, and physical education). Indeed, those preparing for elementary teaching completed more general education courses (when upper and lower level courses are combined) than the arts and sciences graduates did in mathematics, English, and in

the social sciences. The accumulation of science hours is similar. How rigorous this general education is for the elementary education teachers, however, is questionable. The evidence in mathematics, where 4 hours out of a total average of 8 hours taken represents mathematics courses designed primarily for elementary teachers (with emphasis on topics such as real numbers), casts doubt on the rigor in this discipline. The fact that English and mathematics credits together (the two subjects elementary teachers presumably will be stressing in future classrooms) represent fewer hours than those taken in all the social sciences combined is worrisome.

The distribution of general education courses between lower and upper levels reveals that approximately 11 hours of upper level general education courses, representing 15 percent of total general education credits, are taken by elementary teachers. This includes academic courses designed for teachers, some of which are at the upper level.

One bemoans the general ignorance of the population about science and technology. In an electronic society, most of the adult population knows next to nothing about the use of electronics and the impact on society. Adults' memories of the science they learned in school usually centers on the cutting up of frogs in biology and studying rocks in other science courses. There is little evidence that the general education of teachers (especially elementary teachers) does much to change these images. Biology (which these teachers probably took in high school) still overpowers chemistry and physics courses, including survey ones; courses in geology and astronomy are also more popular. Do teachers graduating from teacher education programs have sufficient knowledge of science content and skill in using scientific processes to pass these on to the next generation of children? Or, will we continue to have a "technologically ignorant population"?

To the extent that the lack of exposure to foreign languages contributes to cultural insularity and provincialism, teachers are victims. In their general education they complete less than two hours, on the average, in foreign languages. Three-quarters of all teachers have never taken a college foreign language course. (It is doubtful that they did so in high schools, which until just recently had totally deemphasized foreign languages.) While the study of one or two years of foreign language certainly does not produce teachers who can teach a language to children, such study does stress grammar and awakens an interest in connections between and origins of words. What likelihood is there of teachers being able to enrich their students' study of vocabulary and spelling when they themselves have not made the connections through the study of foreign languages?

The public bemoans that school children have so little exposure to issues about their values and ethics. Could this be related to the fact that the teachers took no courses in which they had to deal with fundamental issues of what constitutes truth and goodness? The almost total lack of philosophy credits on college transcripts attests to gaps in this facet of liberal education.

The Major

Secondary teachers generally do have an academic major. There are questions about its strength. The credits teachers earn in a major are generally fewer than is the case for their arts and sciences counterparts.

The fact that the secondary teachers earn fewer upper level credits in their majors than the arts and sciences graduates may not be a serious problem. Do secondary teachers need a great deal of upper level college work to teach in the high schools? In some disciplines, upper level courses prepare students for graduate work and for specialized tracks within a discipline. Such content may not be particularly relevant to secondary school teaching. However, study of advanced level courses may be necessary for complete understanding of the subject.

Breadth of content, on the other hand, is very crucial in the preparation of high school teachers, especially because the preponderance of the nation's high schools now enroll less than 1,000 students. With student bodies smaller than was the case in the 1970s, there is less opportunity in the current high schools to offer a variety of courses. There is also less time for electives because of the tighter high school graduation requirements. Thus, while the English teacher may be expected to coach the drama club, or possibly even teach one period of drama, there is usually no occasion to use a drama specialist throughout the day. Even for physics, which some would consider more important than drama, demand is unlikely to be sufficient to require more than one or two periods per day. The alternatives include educating secondary science teachers broadly, so they could handle more than one subject at an introductory high school level, or to produce teachers who know quite a bit about one subject, for example, biology, but who have little or no background in other areas, such as physics. A study of one science in depth with "coverage" in all other science areas seems to be the answer to the depth and breadth question.

The two types of teachers for whom the issue of breadth versus specialization is important are the science and social science secondary teachers. For the science teachers, the overwhelming concentration is biology. There is a need for more emphasis in their college programs on the physical sciences. For the social studies teachers, if their college American history courses do not include American government, more focus is required on political science. Economics is also neglected in their preparation.

Education Courses: Elementary and Special Education Teachers

There is substantial variation between the education coursework taken by elementary and special education teachers, and other teachers. Those preparing for elementary

assignments are taking more than half again as many credits in education as the certification regulations require, and five credits more, on the average, than their colleges specify.

When credits in academic courses designated primarily for teachers are included with education courses, elementary and special education teachers devote 42 percent and 51 percent, respectively, to what, for them, is the major. The proportion is somewhat higher when education hours transferred from other colleges are included. The percentage of the baccalaureate program these teachers devote to their major exceeds the proportion arts and sciences graduates generally devote to their area of concentration, with the exception of the fine arts majors. The proportion of total credits that arts and sciences graduates devote to their majors does not exceed one-third except for the average 46 percent of the fine arts group and the 39 percent of the physical sciences majors.

The elementary teachers are spending a substantial portion of their 49 education hours in "methods" courses. The term "methods courses" is sometimes broadly used to include all education courses, but in this study it refers to the education courses that explore the materials and techniques for teaching language arts, reading, science, social studies, art, mathematics, etc. to children. The elementary teachers in this study spent, on the average, 19 hours in such courses.

There is no question that to be able to "put over" content to young children elementary teachers need a unique set of skills, and that these must be addressed by the education curriculum. But, is it not possible to identify generic skills that are used in the various content areas and incorporate them into one or two "methods" courses, instead of requiring separate ones for every major content area? Could some of this "methods" time be spent more profitably in covering research findings on effective

teaching and schools, on the theories of learning, and on techniques of classroom management--all of these subjects being offered in conjunction with field work and applications?

Follow-up studies of teacher education program graduates have repeatedly demonstrated that teachers rate student teaching higher than other education courses. The chance to apply theory, and to try out methods, means more to them than the campus-based academic-learning-style education courses. Yet, elementary teachers average fewer hours in coursework with practical applications (16 hours) than in campus-based "methods" courses (19 hours).

Besides "methods" and field work courses, the elementary teachers average 14 hours in other education courses. The most frequently included courses in this "other" category are the "foundations" courses. These are sometimes titled "Introduction to Education," and deal with the historical, philosophical, cultural, social, and legal foundations of education. These courses are usually rated quite low by graduates of teacher education programs, and are candidates either for substantial improvement or for elimination.

The special education teachers take more education courses than any other types of teachers (69 hours, on the average, without counting transferred credits or academic courses designed primarily for teachers). This amount of concentration in the major is bound to put pressure on time available for general education and academic content areas. Although special education majors spend more time than any other teachers in courses with field applications (24 hours, on the average), they also spend more time on "other" education courses (28 hours) that cover the various aspects of special education.

Education Courses: Other Teachers

Secondary academic teachers, on the average, devote 28 hours to education courses. This usually covers student teaching, one or two "methods" courses, one or two foundations courses, and educational psychology in the seven institutions where this is housed in the College of Education. The average hours taken in education courses exceed the average requirement of the certification regulations by 6 hours.

Physical Education/Health and Fine Arts teachers take the lowest number of education courses of all the teacher groups. Both devote approximately 10 hours to student teaching, with much of the remaining 13-16 education hours divided between "methods" and "other" education courses. Physical education and health courses, however, may include additional material oriented to pedagogy, beyond what is offered in the education courses per se. The fine arts teachers carry heavy concentrations in fine arts courses, leaving little time in their baccalaureate program for education courses. Also, some of their fine arts courses are designed primarily for teachers and, thus, offer another opportunity for pedagogical orientation.

Comparison to the 1960s

James D. Koerner also evaluated transcripts, course-by-course, for a substantial number of teacher graduates in 1961. In his book, The Miseducation of American Teachers, he provides results for transcripts of 435 elementary teachers and 446 secondary teachers from 32 representative institutions throughout the nation. The predominant conclusion from comparing his findings to those for the 1982-83 graduates of 14 Southern institutions is, "How little has changed!"

Koerner's findings for those variables that were also tabulated by SREB for the 1982-83 teacher group are compared in Table 35.

Table 35

COMPARISON OF COURSES TAKEN BY TEACHERS, 1961 AND 1982-83

	Koerner Findings, 1961	SREB Study Group, 1982-83
Average Number of Education Course Hours:		
Elementary Teachers	49.9	49.4*
Secondary Teachers	27.6	28.3*
Average Percent Education of Total Credits:		
Elementary Teachers	41%	36%*
Secondary Teachers	22%	20%*
Average Hours of Practice Teaching:		
Elementary Teachers	8	10
Secondary Teachers	7	9
Average Hours in English Courses:+		
Elementary Teachers	12	12
Average Hours in Mathematics Courses:+		
Elementary Teachers	2	4**
Average Hours in Science Courses:+		
Elementary Teachers	9	11**
Average Hours in Foreign Language Courses:+		
Elementary Teachers	4	2

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* Excluding additional hours in transferred credits, and academic courses designed for teachers

** Excluding academic courses designed for elementary teachers

\+ General education

Although the percent that education courses relative to total credits represent in this 1980s study is lower than it was in the 1960s, differences in the methods of the two reports may account for this. The SREB percentages are calculated as a proportion of actual total credits earned, while the Koerner proportions relate to the total of academic and education course hours, leaving out physical education and other non-academic credits that were included in the SREB totals.

Koerner, too, noted that teachers of art and music spend a tremendous proportion of their time on their specialties, leaving no time for "liberal" education, and that many teachers take no work at all in mathematics and foreign languages.

In 1961, he deplored that teachers were taking substantially more credits in education courses than the state certification requirements called for. That conclusion is no different than the one in this study. Average education credits under certification requirements for elementary teachers in 1961, according to Koerner, totaled 23 hours. The average for the 14 Southern states, at this time, is 30 hours--an increase of 30 percent. For secondary teachers, too, the average required education courses for the 14 Southern states--22 hours--are higher than the 18.7 noted by Koerner in 1961.

Directions for Change

Elementary Teachers

A profile that summarizes the course-taking patterns of the 1,251 elementary and early childhood education teachers in this study is shown in Table 36. The average elementary teacher amassed 137 semester hours for graduation, thus exceeding the minimum credits students are expected to earn during a four-year program toward the baccalaureate. The arts and science graduates, however, also exceeded the "normal" baccalaureate program with their average of 135 credit hours.

Table 36

PROFILE OF ELEMENTARY TEACHER PREPARATION PROGRAM

		Average Hours	Average Percent of Total Credits
General Education			
Regular Academic Courses		61.8	45%
Academic Courses for Teachers		7.5	5
Education Courses		49.4	36
Methods	18.8		
Field Applications	16.4		
Other Education	14.2		
Physical Education and Transferred Physical Education/ Education Hours		9.0	7
Other Courses		9.2	7
Total		136.9	100%

The elementary teachers' program includes 45 percent of total credits in regular general education courses, plus another 5 percent in academic courses designed for teachers. The remainder of the program includes the education and physical education courses (43 percent combined), and 7 percent credits that fall in none of the above categories. These might be business administration courses, which some students sample before they decide on their final major, or other non-coded courses, such as home economics or speech.

Does the above profile suggest that there might be sufficient room to strengthen the program within the baccalaureate sequence, or is there a need to increase the time devoted to preparation?

Two strategies are suggested by the findings of this study--both within the confines of the baccalaureate program. First, while the elementary teachers spend a substantial portion of their program in general education, there is considerable doubt about the rigor of the courses they take. If the program in other disciplines is as weak as that found in mathematics, the quantity of general education may be sufficient, but the

level of the courses is in question. It may not be necessary to increase the number of hours spent in general education, but the content covered should be at the college level, rather than remedial or repetitive of high school content. If students are not ready for college-level work, remedial work must precede their participation in and ability to tackle a true college-level curriculum.

Completion of a more rigorous general education program during the freshman and sophomore years--on the basis of which one could expect that students have mastered communication skills, have honed critical thinking skills, and have developed the ability to read at complex levels--would enhance the level of what is then offered in pedagogy courses. Students with a sound foundation in general education could be expected to tackle the history and philosophy of education in depth, instead of by memorization of lists. Students attuned to college-level reading could be exposed to research on theories of learning and teaching, instead of devoting 19 credit hours to techniques and materials used in language arts, science, mathematics, and art classrooms.

These observations tie in with the second strategy directed to better utilization of the four-year sequence to train elementary teachers. If separate "methods" courses could be consolidated in favor of a more generic approach, some time would be freed for a strengthened "professional education" component that deals with the new research on effective teaching and permits more field applications to bring theory to life.

In sum, from the perspective of this analysis, an opportunity exists to tighten the general education and pedagogy components for elementary teachers within the framework of the baccalaureate if, as students, they are ready to tackle college-level work.

Other Teachers

The foremost strategy to improve the programs for other teachers that is suggested by this study centers on their general education. Taken as a whole, the general education

for all teachers represents fewer hours in each of the divisions of the liberal arts than is the case for elementary teachers. Thus, it is the general education program of all the other teachers that is bringing down the averages of courses in mathematics, science, English, social sciences, and other liberal arts taken by all teachers.

It is not just that other teachers are taking even fewer hours of general education than the elementary teachers do. The problems in the quality of the general education coursework are certainly not unique to any one group of teachers. Nor, are the arts and sciences graduates immune to these problems.

Is there a need to adjust the amount of pedagogy coursework secondary teachers complete? On the average, they spend 28 hours on education courses, which is less time than they spend on their majors. Yet, the 28 hours in education courses exceed the average requirement for secondary teachers in state certification regulations.

Some experimental programs are now immersing arts and sciences graduates in concentrated summer programs on pedagogy, and then providing them with assistance and feedback during their first year of teaching. If such programs are successful, it may be possible to reduce the average 28 hours that secondary teachers in regular programs spend in education courses. The contrast between their taking that amount of pedagogy to teach 13- to 18-year-olds, when college professors teach 18- and 19-year-old freshmen without any pedagogy courses, may suggest that there is some middle position. Also, teachers preparing for 11th and 12th grade assignments may need a different amount and/or content in pedagogy than those who will teach younger students.

The total credits earned for graduation by all teachers average 142 hours, which is more than the 135 hours for arts and sciences graduates and 137 for elementary teachers. The higher average for all teachers may be affected by the programs required for the special education and the fine arts teachers, and the secondary academic teachers, who earn 28 education hours on top of their majors.

As was noted earlier, the secondary teachers are not accumulating enough hours in their content majors to match the averages of their arts and sciences counterparts. Thus the question of whether the baccalaureate is a long enough time for the secondary teachers centers on the question of whether some of the time spent on pedagogy could be shifted to more work in the major. Or, if that is not a feasible alternative, does the program need to be lengthened to permit the current degree of emphasis on pedagogy plus a strengthened major?

In conclusion, the overwhelming impression gained by the experience of coding the transcripts of over 6,000 college graduates of major universities in the South is the need to improve the general education component of the baccalaureate for all students--teachers and arts and sciences graduates alike. To the extent that expected coursework at the freshman and sophomore levels may then represent college-level content, it is likely that the other facets of teacher preparation will fall into place. As high schools raise academic units required for graduation, and colleges tighten their admission requirements regarding college preparatory programs, it is possible that the transcripts of college graduates for the class of 1989-90 may look quite different from those in this study for 1982-83. One must hope so.

APPENDIX A

PARTICIPATING INSTITUTIONS

Appalachian State University (North Carolina)
Arkansas State University
Auburn University (Alabama)
East Texas State University
Eastern Kentucky University
Florida State University
James Madison University (Virginia)
Louisiana State University
Marshall University (West Virginia)
Southwest Texas State University
Towson State University (Maryland)
University of Georgia
University of Kentucky
University of North Carolina at Chapel Hill
University of South Carolina
University of Southern Mississippi
University of Tennessee

APPENDIX B

TRANSCRIPT STUDY
BACKGROUND INFORMATION

Name of Institution_____

Important!

On each transcript supplied to us, be sure to mark as follows: "Eligible for certification" for education majors AND for arts and sciences majors who have completed a sequence of education courses which makes them eligible for certification; "Not eligible for certification" for other graduates.

QUESTIONS:

1. Does the transcript show the SAT or ACT score? Yes_____No_____

2. Is the academic major of the student indicated on the transcript?
   Yes_____ No_____

3. For education majors, is the specialty for which the graduates may be certified (e.g., early childhood) shown on the transcript?
   Yes_____ No_____

4. Does the total number of credit hours taken appear on the transcript?
   Yes_____ No_____

Transfer Credits

5. Does the name of the institution from which the courses were transferred appear on the transcript?
   Yes_____ No_____

6. Can you supply us with a copy of the junior college or university transcript for each transfer student?
   Yes_____ No_____

7. In listing transfer credits on the transcript, which approach is used?

   (a)___ We translate transferred courses into numbers of our equivalent courses
   (b)___ We list transfer courses by the course number and title assigned by the college of origin
   (c)___ We do not itemize transferred courses, but only show the total number of credits transferred
   (d)___ Other (please explain) _____

Credit by CLEP or Advanced Placement

8. How does your transcript identify courses for which credit is given by CLEP or Advanced Placement? (Please describe)

Credit and Non-Credit Hours

9. How does your transcript differentiate between listed courses for which credit was or was not earned?

(a)___ only courses for which credit is earned are listed

(b)___ courses for which no credit was earned are listed, but no earned hours are show for such courses

(c)___ courses with grades below___are listed, and hours are shown, but these low grades do not count for credit

(d)___ other (please explain)_____

_____

Course Level

10. Is the course numbering system in your catalogue indicative of the level of the course? Are 100 courses freshman courses, 200 courses sophomore courses, etc.? Yes_____ No_____

If "no":

We will need a listing of all your courses within the disciplines listed in the Coding Variables, by lower and upper division classifications.

In order to do this, you might mark the courses in your 1982-83 catalogue as either "lower division" or "upper division" in the applicable disciplines.

NEEDED INFORMATION ABOUT SPECIFIC DISCIPLINES

Mathematics

11. Please identify the courses offered in 1978-79 that fall into the following categories:

(a) Developmental or remedial math course(s) for which credit may be given:

_____ _____ _____

(b) The entrance-level mathematics course(s) that is (are) not remedial, for which the expected preparation of the student is completion of high school Algebra I and II, and Geometry:

_____ _____ _____

(c) The entrance-level mathematics course(s) that is (are) not remedial, for which the expected preparation of the students is completion of high school Algebra I:

_____ _____ _____

(d) The entrance-level mathematics course(s) that is (are) not remedial, and that is (are) offered for education majors:

_____ _____ _____

English

12. Pleases identify the courses offered in your 1979-80 catalogue that fall into the following categories:

(a) Developmental or remedial English course(s) for which credit may be given:

_____ _____ _____

(b) The entrance-level English course(s) which is (are) the normal requirement(s) for undergraduates who do not fall into the "remedial or developmental" category:

_____ _____ _____

(c) The lower division English course(s) that include(s) a substantial composition or writing component (at least half of the course):

_____ _____ _____

APPENDIX C

TRANSCRIPT STUDY
CODING FORM

FILE NUMBER	UNIVERSITY	CLASSIF	MAJOR	AREA	SAT-V	SAT-M	ACT	CREDIT HOURS

ADVANCED PLACEMENT & C.L.E.P.

SUBJECT	FIELD #	HOURS
MATH	1	
ENGLISH	2	
HISTORY	3	
SCIENCE	4	
SOC. SCI.	5	
HUMANITIES	6	
LANGUAGES	7	
OTHER	8	

SUBJECT	COURSE TYPE	FIELD #	HOURS
MATH	Remedial Level	9	
Lower Level	Level 1 Pre-req.	10	
	Level 2 Pre-req.	11	
	Teachers Only	12	
	OTHER	13	
Upper Level	Regular Math	14	
	Teachers Only	15	
COMP. SCI.	Lower	16	
	Upper	17	
ENG. & LIT.	Remedial	18	
Lower Level	Regular with Comp	19	
	Regular no Comp	20	
Upper	Total Upper	21	
BIOL. SCI.	Regular with Lab	22	
	Regular no Lab	23	
Lower Level	Teacher with Lab	24	
	Teacher no Lab	25	
	Non-maj. with Lab	26	
	Non-maj. no Lab	27	
Upper Level	With Lab	28	
	No Lab	29	
	Teachers with Lab	30	
	Teachers no Lab	31	
LANG.	Lower	32	
	Upper	33	
Upper	Teachers Only	34	
FINE ARTS	Lower	35	
	Upper	36	
Upper	Teachers Only	37	

SUBJECT	COURSE TYPE	FIELD #	HOURS
PHYSICS	Regular with Lab	38	
	Regular no Lab	39	
Lower Level	Teachers with Lab	40	
	Teachers no Lab	41	
	Non-maj. with Lab	42	
	Non-maj. no Lab	43	
Upper Level	With Lab	44	
	No Lab	45	
	Teachers with Lab	46	
	Teachers no Lab	47	
CHEM	Regular with Lab	48	
	Regular no Lab	49	
Lower Level	Teachers with Lab	50	
	Teachers no Lab	51	
	Non-maj. with Lab	52	
	Non-maj. no Lab	53	
Upper Level	With Lab	54	
	No Lab	55	
	Teachers with Lab	56	
	Teachers no Lab	57	
OTHER PHYS & EARTH SCI.	Regular with Lab	58	
	Regular no Lab	59	
Lower Level	Teachers with Lab	60	
	Teachers no Lab	61	
	Non-maj. with Lab	62	
	Non-maj. no Lab	63	
Upper Level	With Lab	64	
	No Lab	65	
	Teachers with Lab	66	
	Teachers no Lab	67	
HIST.	Lower	68	
	Upper	69	
Upper	Teachers Only	70	
ECON.	Lower	71	
	Upper	72	
SOC.	Lower	73	
	Upper	74	
POL. SCI.	Lower	75	
	Upper	76	
PSYCH	Lower	77	
	Upper	78	

SUBJECT	COURSE TYPE	FIELD #	HOURS
OTHER SOCIAL SCI.	Lower	79	
	Upper	80	
OTHER HUMAN.	Lower	81	
	Upper	82	
	Teachers Only	83	
PHILOS.	Lower	84	
	Upper	85	
	Teachers Only	86	
P.E.	Lower	87	
	Upper	88	
EDUC.	Math Methods	89	
	Science Methods	90	
Lower Level	Other Methods	91	
	Other Educ.	92	
	Practicum	93	
Upper Level	Math Methods	94	
	Science Methods	95	
	Other Methods	96	
	Other Educ.	97	
	Practicum	98	
	Student Teaching	99	

TRANSFER CREDIT FROM JUNIOR COLLEGE OR UNIVERSITIES

SUBJECT	FIELD #	HOURS
MATH	100	
ENGLISH & LIT.	101	
BIOL. SCI.	102	
CHEM.	103	
PHYS.	104	
OTHER PHYS & EARTH SCI.	105	
ECON	106	
HIST	107	
SOC	108	
POL	109	
PSYCH	110	
OTHER SOC SCI	111	
LANG	112	
FINE ARTS	113	
HUMANITIES	114	
EDUC. & P.E.	115	

APPENDIX D

EXCLUSIONS IN COMPUTING GENERAL EDUCATION CREDIT HOURS

Courses	Majors Excluded in General Education Statistics
Mathematics	Mathematics, Mathematics Education (Mathematics and Computer Science Certification)
Science	Biological and Physical Sciences, Science Education (Science Certification)
English	English, English Education (English Certification)
Social Sciences	Anthropology, Criminology, Economics, Geography, History, Political Science, Psychology, Sociology, Other Social Sciences, Social Science Education (Social Studies Certification)
History	History, History Education (History Certification)
Political Science	Political Science, Social Science Education (Social Studies Certification)
Psychology	Psychology, Social Science Education (Social Studies Certification)
Economics	Economics, Social Science Education (Social Studies Certification)
Sociology	Sociology, Social Science Education (Social Studies Certification)
Other Social Sciences	Other Social Sciences, Social Science Education, Anthropology, Geography, Criminology (Social Studies Certification)
Languages	French, German, Spanish, Other Language, Language Education (Foreign Language Certification)
Humanities	English, Philosophy, Religious Studies, Other Letters, History, French, Spanish, German, Other Language, English Education, Language Education (English, Social Studies Certification)
Fine Arts	Art, Music, Drama, Other Fine Arts, Art Education, Music Education, Drama Education (Art, Music, Drama Certification)
Philosophy	Philosophy
Other Humanities	Philosophy, Religious Studies, Other Letters
Other Liberal Arts	Art, Music, Drama, Other Fine Arts, Philosophy, Religious Studies, Other Letters, French, Spanish, German, Other Language, Art Education, Music Education, Drama Education, and Language Education (Art, Music, and Drama Certification)

APPENDIX E

NUMBER AND PERCENT OF TEACHERS AND ARTS AND SCIENCES GRADUATES INCLUDED IN CALCULATING EACH DIVISION OF GENERAL EDUCATION STATISTICS

	Teachers		Arts and Sciences	
	Number	Percent	Number	Percent
Mathematics	3,127	95%	2,639	96%
Science	3,158	96	2,083	75
English	2,992	91	2,597	94
Social Science	3,008	92	1,541	56
Other Liberal Arts	2,827	86	2,202	80
Humanities*	2,731	83	2,315	84

* See page 35 for definition of humanities, a division which overlaps with other, or parts of the other, divisions of general education

APPENDIX F

SPECIALTIES INCLUDED IN EACH "MAJOR"

Arts and Sciences Majors

Mathematics	
Biological Sciences	biology, botony, zoology, microbiology, biochemistry, marine biology, other biological sciences
Physical Sciences	physics, chemistry, geology, other physical or earth sciences
English	
History	
Political Science	
Psychology	
Economics	
Sociology	
Languages	French, German, Spanish, other foreign languages
Fine Arts	art, music, drama, other fine arts

Teacher Education Majors

Mathematics	arts and sciences mathematics majors eligible for certification; mathematics education; general education, secondary education-mathematics certification
Sciences	arts and sciences science majors eligible for certification; science education; general education, secondary education-science certification
English	arts and sciences English majors eligible for certification; English education majors
Social Studies	arts and sciences social sciences (anthropology, criminology, economics, geography, history, political science, psychology, sociology, and other social sciences) majors eligible for certification; social sciences education, general education, secondary education-social science certification
Languages	arts and sciences foreign languages (French, German, Spanish, others) majors eligible for certification; foreign language education
Fine Arts	arts and sciences fine arts (art, music, drama, other) majors eligible for certification; art education, music education, drama education; general education, secondary education-art/music/drama certification
Physical (Health) Education	physical education or health education majors; general education, secondary education-physical education/health certification

APPENDIX G

COURSES INCLUDED IN COMPILING HOURS IN ARTS AND SCIENCES MAJORS

Mathematics
advanced placement mathematics; transfer mathematics; lower and upper level mathematics courses

Biological Sciences
transfer biology; lower and upper level biological science courses

Physical Sciences
transfer chemistry, physics, earth sciences; lower and upper level physics, chemistry, and other physical and earth science courses

English
advanced placement English; transfer English and English literature; lower and upper level English courses

History
advanced placement history; transfer history; lower and upper level history courses

Political Science
transfer political science; lower and upper level political science courses

Psychology
transfer psychology; lower and upper level psychology courses

Economics
transfer economics; lower and upper level economics courses

Sociology
transfer sociology; lower and upper level sociology courses

Languages
advanced placement foreign languages; transfer foreign languages; lower and upper level foreign language courses

Fine Arts
transfer fine arts; lower and upper level fine arts courses

APPENDIX H

COURSES INCLUDED IN COMPILING HOURS IN TEACHER EDUCATION MAJORS

Mathematics Education

advanced placement mathematics; transfer mathematics; and lower and upper level mathematics courses

Mathematics/Computer Science Education

advanced placement mathematics; transfer mathematics; lower and upper level courses in mathematics and computer science

Science Education

advanced placement science; transfer biological science, chemistry, physics, other physical and earth sciences; lower and upper level courses in biological science, chemistry, physics, and other physical and earth sciences

English Education

advanced placement English; transfer English; lower and upper level courses in English

Social Science Education

advanced placement history; advanced placement social science; transfer economics, history, sociology, political science, psychology, other social sciences; lower and upper level courses in history, economics, sociology, political science, psychology, and other social sciences

Foreign Language Education

advanced placement foreign language; transfer foreign language; and lower and upper level courses in foreign languages

Fine Arts Education

transfer fine arts; lower and upper level courses in fine arts (art, music, drama, and other fine arts)

Physical Education

lower and upper level courses in physical education

APPENDIX I

RESULTS AND ANALYSES OF MAJORS

PERCENT OF TOTAL CREDIT IN MAJOR, BY NUMBER AND PERCENT OF GRADUATES

Percent of Total Credit in Major	Mathematics				Sciences						English				Social Sciences												Languages				Fine Arts			
	Teachers		Arts & Sciences		Teachers Science		Arts & Sciences Biology		Arts & Sciences Physics		Teachers		Arts & Sciences		Teachers Soc. Sci.		Arts and Sciences History		Arts and Sciences Pol. Sci.		Arts and Sciences Psych.		Arts and Sciences Econ.		Arts and Sciences Soc.		Teachers		Arts & Sciences		Teachers		Arts & Sciences	
	N	%	N	%	N	%	N	%	N	%	N	%	N	%	N	%	N	%	N	%	N	%	N	%	N	%	N	%	N	%	N	%	N	%
1-19%	21	16.4	23	19.0	6	5.2	13	3.5	5	1.6	5	3.3	2	1.2	2	.8	7	5.3	17	6.5	26	5.9	26	36.6	12	10.4	5	15.6	3	3.4	14	3.4	10	2.4
20-26%	69	53.9	29	24.0	26	22.4	122	33.2	10	3.2	58	38.7	21	12.9	---	---	37	27.8	128	49.2	126	28.7	37	52.1	35	30.4	6	18.8	12	13.5	39	9.4	13	3.2
27-33%	35	27.3	46	38.0	18	15.5	156	42.5	74	23.9	71	47.3	58	35.6	14	5.3	65	48.9	79	30.4	169	38.5	7	9.9	44	38.3	6	18.8	22	24.7	91	21.8	46	11.3
34-39%	3	2.3	13	10.7	25	21.6	55	15.0	60	19.4	16	10.7	54	33.1	20	7.5	20	15.0	25	9.6	78	17.8	1	1.4	16	13.9	11	34.4	22	24.7	88	21.1	54	13.3
40-49%	---	---	10	8.3	35	30.2	18	4.9	121	39.0	---	---	24	14.7	39	14.7	4	3.0	10	3.8	30	6.8	---	---	8	7.0	3	9.4	23	25.8	143	34.3	122	30.1
50%-above	---	---	---	---	5	4.3	3	.8	40	12.9	---	---	4	2.5	183	69.1	---	---	1	.4	10	2.3	---	---	---	---	1	3.1	7	7.9	40	9.6	160	39.5
Total	128		121		115		367		310		150		163		258		133		260		439		71		115		32		89		415		405	

APPENDIX J

RESULTS AND ANALYSES OF MAJORS

PERCENT OF CREDIT IN MAJOR AT UPPER LEVEL, BY NUMBER AND PERCENT OF GRADUATES

Percent of Total Credit in Major	Mathematics				Sciences						English				Social Sciences												Languages				Fine Arts			
	Teachers		Arts & Sciences		Teachers Science		Arts & Sciences Biology		Arts & Sciences Physics		Teachers		Arts & Sciences		Teachers Soc. Sci.		Arts and Sciences History		Arts and Sciences Pol. Sci.		Arts and Sciences Psych.		Arts and Sciences Econ.		Arts and Sciences Soc.		Teachers		Arts & Sciences		Teachers		Arts & Sciences	
	N	%	N	%	N	%	N	%	N	%	N	%	N	%	N	%	N	%	N	%	N	%	N	%	N	%	N	%	N	%	N	%	N	%
0	---	---	18	14.9	5	4.3	6	1.6	5	1.6	3	2.0	2	1.2	2	.8	---	---	3	1.1	9	2.3	1	1.4	2	1.7	---	---	2	2.2	7	1.7	3	.7
1-19%	2	1.6	---	---	18	15.5	---	---	18	5.8	2	1.3	1	.6	19	7.4	1	.8	---	---	2	.5	---	---	---	---	---	---	4	4.5	31	7.4	12	2.9
20-34%	25	19.5	4	3.3	39	33.6	10	2.7	48	15.5	13	8.7	6	3.7	84	32.5	4	3.0	1	.4	10	2.3	---	---	2	1.7	3	9.4	12	13.5	96	23.1	82	20.2
35-49%	52	40.6	37	30.6	43	37.1	42	11.4	85	27.4	19	12.7	9	5.5	90	34.9	16	12.0	9	3.5	24	5.4	---	---	4	3.5	5	15.6	26	29.2	139	33.5	121	29.9
50-64%	44	34.4	41	33.9	9	7.8	124	33.8	118	38.1	63	42.0	57	35.0	62	24.0	55	41.4	43	16.5	72	16.4	25	35.2	16	13.9	9	28.1	32	36.0	110	26.4	121	29.9
64%-above	5	3.9	21	17.4	1	.9	185	50.4	36	11.6	50	33.3	88	54.0	1	.4	57	42.9	204	78.5	322	73.3	45	63.2	91	79.1	15	46.9	13	14.6	32	7.7	66	16.3
Total	128		121		115		367		310		150		163		258		133		260		439		71		115		32		89		415		405	

APPENDIX K

GRADUATES INCLUDED IN EACH CATEGORY FOR EXAMINATION OF EDUCATION COURSES

All Teachers (N = 3,283)

All persons eligible to be certified. In institutions with two areas of certification for all or the majority of graduates, the first area of certification was used to determine the appropriate category.

Secondary Academic (N = 716)

Certification in science, mathematics, foreign languages, social sciences, and English education. (Graduates with elementary education or early childhood education as a major with an academic area for certification were excluded.)

Elementary and Early Childhood (N = 1,251)

Majors or certification in elementary or early childhood education. (Graduates with special education major or certification were not included.)

Special Education (N = 524)

Certification major in special education.

Fine Arts (N = 404)

Certification in art, music, or drama.

Physical Education (N = 355)

Certification in physical education.

Elementary and Early Childhood Education Majors

APPENDIX L

PERCENT OF TOTAL CREDIT HOURS TAKEN IN EDUCATION, BY NUMBER AND PERCENT OF TEACHERS

Percent of Total Hours in Courses	Frequency	Percent
1-19%	911	27.7%
20-26%	558	17.0
27-33%	450	13.7
34-39%	446	13.6
40-49%	617	18.8
50%-above	301	9.2
Total Number	3,283	

APPENDIX M

PERCENT OF TOTAL CREDIT HOURS TAKEN IN ACADEMIC COURSES FOR TEACHERS, BY NUMBER AND PERCENT OF TEACHERS

Percent of Total Hours in Courses Designed for Teachers	Frequency	Percent
0	1,437	43.8%
1- 9%	1,569	47.8
10-19%	272	8.3
20-29%	5	.2
Total Number	3,283	

APPENDIX N

PERCENT OF EDUCATION HOURS IN "METHODS" COURSES, BY VARIOUS GROUPS OF TEACHERS

Percent of Education Hours in "Methods"	All Teachers		Secondary Teachers		Elementary Teachers	
	Frequency	Percent	Frequency	Percent	Frequency	Percent
0	249	7.6	42	5.9	3	.2
1-9%	112	3.4	27	3.8	4	.3
10-19%	549	16.7	106	14.8	99	7.9
20-29%	723	22.0	229	32.0	185	14.8
30-49%	1428	43.5	292	40.8	781	62.4
50%-above	222	6.8	20	2.8	179	14.3